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REPORT

OF THE

OYSTER COMMISSION

OF THE

STATE OF MARYLAND,

11816

JANUARY, 1884.

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REPORT

OF THE

ALBERT SMALL,
Attorney at Law,
HAGERSTOWN, MD.

OYSTER COMMISSION

OF THE

STATE OF MARYLAND.

11816

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To the Honorable the General Assembly of the State of Maryland:

The Oyster Commissioners appointed by His Excellency, the Governor of Maryland, under the Joint Resolution of the General Assembly of Maryland, assented to at the session of 1882, beg leave to respectfully submit the following report:

The magnitude and complexity of the subject, and the diversity of the interests which are involved has rendered the length of this report an unavoidable necessity, and we shall therefore present, first, a summary or abstract of the results of our examination of the question, and we shall then give our results and opinions in full. We have therefore divided the report into four parts: first, an outline or abstract of the whole; second, a statement of the facts which we have been able to obtain; and third, the recommendation of the measures of protection which we regard as necessary; and fourth, a minority report by Wm. Henry Legg, stating his objection to some points of the report.

Respectfully submitted,

W. K. BROOKS,
JAMES I. WADDELL,
WM. HENRY LEGG,
Commissioners.

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CHAPTER I.

A Summary of the Results of our Examination of the Oyster Problem, and an Outline of the Measures of Protection which we regard as necessary.

THE RESOLUTION TO APPOINT AN OYSTER COMMISSION.

The Resolution of the General Assembly of Maryland, under which we are appointed, is as follows:

"*Whereas* the oyster interest of this State is one of its most important industries, giving employment to thousands of its citizens and having millions of capital invested therein; and *whereas* it is reported that recent investigations have shown that the oyster beds of the State have been seriously impaired by over-dredging and unwholesome laws, and are in danger of complete destruction at an early day unless checked by remedial legislation; and *whereas* it is impossible for the present Legislature to adopt proper laws for want of time and of reliable and sufficient information upon the subject, and it is important that the next General Assembly have laid before it the true condition of the oyster beds of the State, and such other information as will enable them to devise such laws for the immediate protection of the same; therefore be it

"RESOLVED *by the Senate and House of Delegates of Maryland*, That the Governor be and he is hereby authorized to appoint, on or before the first day of June next, three citizens of this State to examine the condition of the oyster beds of the State and report the same to the next General Assembly, with such recommendation as will conduce to the protection of this important industry.

"RESOLVED, *Second*, That each of said commissioners shall receive the sum of five hundred dollars and actual expenses for their service, the same to be paid out of any money in the treasury to the credit of the oyster funds."

OUTLINE OF OUR REPORT.

As soon as possible after your commissioners received notice of their appointment, they held a meeting for organization, and decided that their first duty under the resolution above quoted is to obtain accurate information as to the true condition of the oyster beds of the State by actual personal examination.

We have accordingly visited fifty-nine of our more important oyster beds, and have made three hundred and twenty-six examinations, and have accurately measured and counted all the oysters upon one hundred and twenty thousand nine hundred and fifty-eight square yards of oyster bottom, and the results of this examination are given in tabular form herewith.

We are therefore in a position to state the present value of our oyster beds with very great accuracy, but the attempt to decide whether this value is diminishing, and if so, how rapidly, is attended with great difficulties, as there is no accurate official record of the condition of the beds in the past. The statements of interested fishermen, with limited local experience and with no written records, are clearly of little value in themselves, and in the absence of official records we have been compelled to adopt an indirect method of comparison.

In 1879 Lieut. Francis Winslow, United States navy, an officer of the United States coast survey, made an examination of the oyster beds of Tangier sound, and found at that date that within the limits of the beds there was an average of about one oyster to each three square yards. More exactly stated, his results showed that there was four hundred and nineteen-thousandths of an oyster to each square yard, or one oyster every two and three hundred and eighty-six-thousandths square yards. Lieut. Winslow says that the beds of Tangier sound exhibited evidences of exhaustion in 1879, and it is therefore

probable that the average for all the beds at that date would have been somewhat greater. If we find, therefore, that the average for all the beds of the State at present, is less than Winslow's average for the beds of Tangier sound in 1879, we may safely assume that the difference is due to the deterioration of the beds within the last three years. The results of our examination, which are given in full further on (see chapter II), show an average of one oyster to each four and a quarter square yards, or more exactly, two hundred and thirty-five thousandths of an oyster to each square yard. Our examination therefore shows that within the last three years our beds have lost more than 39 per cent. of their value.

Our observation of the oyster fishermen at their work on the grounds in November, 1882, showed that they are now compelled, by the scarcity of oysters, to glean more carefully and completely than ever before, and the annual injury to the beds must continue to grow greater and greater as the oysters become more scarce.

The results of our examination are therefore seen to fully justify the worst forebodings, and to show that the oyster property of the State is in imminent danger of complete destruction. Having reached this conclusion, the next step was to discover the cause of the injury, and this we have attempted to do partly by personal investigation of the methods employed by the fishermen, partly by listening to the opinions of those interested in the subject, but chiefly by the study of the history of the destruction of oysterbeds in other places where more exact records are obtainable.

Our conclusion, for which reasons will be given in full further on, is that the depletion of our beds is not strictly due to any particular method of gathering oysters, nor to the destruction of the young, nor to the working of the beds at wrong seasons, but to the great demand which comes from improved means of transportation, and from the growth in our State of a great commercial industry which has an unlimited and constantly increasing capacity for utilizing oysters.

No means of protection can have any permanent value unless they are based upon the fact that the present demand taxes the beds far beyond their natural productive power.

Of the ten and one-half million bushels of oysters which were gathered in our waters in 1880, only 875,000 bushels were used as food by the people of the counties, and 1,018,000 by the people of Baltimore and other cities of the State, while 8,675,000 bushels, or more than four-fifths of the whole, were consumed outside the State.

Those who hold that the people of our tide-water counties have a natural right to this supply of food may truthfully assert that if the sale of four-fifths of our oysters to people outside the State were prevented, there would be an abundant supply for our own people; but all civilized communities have recognized the advantage of selling their productions in the best market, and it is hardly necessary to point out the fact that it is not a few capitalists, but the thousands of oyster fishermen who would suffer most by the destruction of the commercial business in oysters. The great mass of the oyster dredgers and tongmen are supported, not by the local demand, but by the wholesale dealers, and the destruction of the wholesale oyster business would deprive these people of the $2,000,000 of earnings which are annually paid them by the dealers, and would deprive fully 50,000 persons of their means of support.

If Maryland is to retain her oyster industry, and is to have her share of the rapidly increasing business which comes from the growing demand for oysters all over the country, the supply of oysters must be artificially increased, for the natural fertility of the beds is not great enough to withstand even the present drain upon them, and the demand for oysters will certainly increase from year to year.

No measures of protection can have any permanent value unless they are based upon the fact that the present demand taxes the beds far beyond their natural productive power.

Laws to regulate the length of the season, or the size of marketable oysters, or to compel culling on the beds, or to restrict the area open to dredgers, or to divide the beds into open and closed districts, may all result in temporary improvement, and in the body of this report we have discussed various measures of this sort, and have recommended many changes in the existing laws, among which are the following:

Since we find that the most serious obstacles in the way of the enforcement by the fishery force of

the laws of the State are the inability of the State to protect the oysters of the Potomac river, and the power which has been conferred by law upon certain counties to permit dredging without a license from the State, we recommend that, inasmuch as the State of Virginia has prohibited dredging in her waters, the State of Maryland approve the existing law of Virginia so far as it relates to dredging in the Potomac river and its tributaries, and we also recommend that the General Assembly enact a law of similar tenor prohibiting dredging in the Potomac river and its tributaries, to take effect so soon as it shall be approved by the State of Virginia; and we also recommend that the proper authorities of our State be required by law to take the steps which are necessary to secure the prompt action of Virginia in this matter.

We also recommend that the State of Virginia be requested to appoint a commissioner or commissioners, who shall meet a commissioner or commissioners to be appointed by the State of Maryland, to agree upon and report to the next Legislature of each State a plan to still further regulate the oyster fisheries of those waters.

We further recommend that the State of Maryland assume the exclusive right to regulate the oyster fishing in all waters where dredging is permitted, and that all laws conferring this power on local authorities be repealed.

In order to protect the tonging and planting grounds from the depredations of dredgers, and in order to enable the State fishery force to render more efficient protection to the grounds, we recommend that the legal boundaries of the area open to dredgers be simplified. At present the boundary of the dredging ground is in some places indefinitely defined, and in other cases it consists of a series of intersecting circles which do not admit of designation by buoys or landmarks, even if there were any legal provisions for the establishment of such marks. We therefore recommend that the boundary be made as nearly as possible a straight line between prominent headlands, and that such a line be established to run around the bay and its tributaries to separate the waters where dredging is permitted from those where it is prohibited. We also recommend that proper landmarks or buoys be placed at all points upon this line where such marks are necessary, and that maps showing the line be furnished to all licensed dredgers, to all officers of the fishery force, and upon payment of their cost to all other persons who may apply for them.

We also recommend that the bottoms upon the deep-water side of the line be divided into eleven districts; six wide districts, alternating with five narrow districts, and that the five narrow districts be closed to the public for an unspecified time, and be left to recuperate and also to furnish a supply of spat for the adjacent open districts.

For the efficient protection of the closed areas and other grounds where dredging is prohibited, and for the effectual enforcement of the oyster laws, we recommend that there be placed upon each of the six open districts and upon the Potomac river a fast seaworthy steamer, which shall be required to be upon duty at all times, in the night as well as in the day time, during the whole year, to prevent unauthorized persons from taking oysters, and to protect the closed districts and the tonging and planting grounds. We also recommend that each boat shall be in command of a seaman who is not a resident of any county which borders upon the district where he is stationed, and who shall be qualified by education and training to make accurate surveys of all oyster beds within his district, and to perform all other duties of his position in a seamanlike manner.

We also recommend that the taking of oysters from the public beds, or the sale of oysters for food, be prohibited between the first day of April and the fifteenth day of October of each year, for two years, and that no person who buys or sells oysters to be used as food be permitted to have in his possession any oysters three hundred of which with their shells do not make at least one bushel.

We also recommend that the burning of oyster shells for lime, or their use in the manufacture of iron, or in the making of roads, be prohibited; and that areas be designated in each district where oyster shells may be deposited, and that all dredgers be compelled to cull their oysters at the time when and place where they are taken.

These various recommendations are stated in full in the body of this report, together with the

reasons for them, and at the end of this report they are embodied in a bill which should, in our opinion, be made a law, since we believe that each of them will help to arrest the destruction of our oyster beds.

We have, however, given many reasons in the body of our report for believing that none of these measures, nor any measure which does not increase the supply of oysters beyond its natural limits, can be of any permanent value.

We have given careful attention to the possibility of artificially increasing the supply, and we have availed ourselves of all sources of information, and have studied the laws and methods which have been found effective in Europe and in other States of our own country. The greater part of this report is made up of information upon this subject from various sources, and we believe that careful examination of it will convince all of the truth of the conclusion which we ourselves have reached—that the oyster bottoms of our State are of greater value than the dry land, and that they will some day support a great and prosperous population.

Their value in the past has been inconsiderable as compared with their possible value in the future, for while the oyster fishermen have never earned much more than two million dollars a year, it is no exaggeration to state that our grounds are capable of yielding hundreds of millions of dollars annually.

The adoption by our people of measures which are already employed with advantage by other communities would increase the wealth and prosperity of Maryland almost beyond computation, and would add to the value and fertility of our oyster grounds in the same way that our farming lands have increased in value since the time when they were uncultivated hunting grounds.

This can be brought about only by bringing the industry and intelligence of man to the assistance of nature, and at present there is little opportunity for enterprise in this direction in Maryland, and our oyster property owes none of its value to human industry, although there are in our State no farming lands which would yield a more sure and ample return for invested capital and labor.

We therefore believe that a complete change must be made in our oyster policy before our people can reap the full benefit of their natural advantages; but as any great change in an established industry is sure to result in hardship and injury to individuals, and is, therefore, to be avoided if possible, we have sought to devise a plan which shall open the way for the gradual introduction of improved methods without taking away the rights or sacrificing the property of any one who is at present engaged in the oyster business, and without restricting these rights any more than the present exhausted condition of our beds renders necessary and unavoidable.

Our views and recommendations upon this highly important subject can be best explained by a discussion of the various sources of the oyster supply and of the means which may be used to improve them.

The sources of the oyster supply are three—from the natural beds, from the oyster planting industry, and from oyster farming.

The natural supply from the beds has been as great in the past as it ever will be, and our efforts should be directed to the artificial increase of their productiveness, and to the protection of the beds from further injury.

As the cause of the deterioration of the beds is over-consumption, the first step for their preservation is the regulation of the supply from each bed according to its capacity.

Before this can be done each public bed must be surveyed and mapped with as much accuracy as if it were farming land above water. Its condition must then be thoroughly examined annually by an expert, who should have power to decide each year what beds are to be open to the public, and for how long a time. The conditions vary so much upon different beds that the establishment of an arbitrary system of open and closed districts is a very crude remedy, but as our beds cover nearly five hundred square miles, and are scattered over nearly six thousand square miles of water, and as they are at present unsurveyed, the system of districts which has been explained above is the best one which seems practicable at present.

We recommend, however, that the officers of each police steamer be required to survey and map

the natural beds in their districts as quickly as possible, and that they be chosen for their fitness for this work, as well as their ability to perform their other duties.

We also recommend that they make annual examination each summer of each bed, and report its condition to an oyster commissioner, who shall be appointed for this purpose by the Governor of the State, and who, together with the Comptroller of the Treasury and the Commander of the State fishery force, shall form a board with power to superintend and direct the surveys and examinations of the beds, and to temporarily close any bed to the public.

There are also many minor measures which should be employed for the preservation of the natural beds, such as legislation to prevent the sale of immature oysters, to compel oystermen to cull on the beds, and to compel the restoration of all shells to the waters of the bay. This latter is a matter of the greatest importance. If the dry, clean shells which accumulate in the winter at the centres of the oyster-packing industry were replaced during the summer upon certain designated spots where they are needed, the area of the beds and their productiveness would be vastly increased. One of your commissioners called attention to this subject in 1879, and if his advice had been followed our beds would not now be in their present exhausted condition.

The second source of supply, oyster planting, is the placing of young "seed" oysters upon bottoms which are favorable for their growth. This industry does not actually produce any new oysters, although it does add very greatly to the value of the annual crop. Young oysters attach themselves in such great numbers, and so close together that any particular one cannot grow to maturity upon an undisturbed natural bed without crowding out and destroying many others; and if these crowded young are scattered over the planting grounds, the number which grow up and become marketable is very greatly increased, and, as the scattered planted oysters grow more rapidly, and are more valuable than those which are crowded upon the natural beds, a planting industry is a great source of wealth. In the chapter on oyster planting, in this report, we have given many reasons why this industry should be fostered and encouraged, and have tried to show how this can be best accomplished.

In another part of our report we have shown that if all the grounds suitable for planting in our waters could be made as profitable per acre as the oyster grounds of the State of Rhode Island now are, they would return annually to their cultivators the sum of six hundred million dollars; and our beds are, in reality, far more valuable than those of Rhode Island, as our waters are free from the destructive enemies which there often destroy a large bed in a few days, and our milder climate protects our oysters from destruction by ice and frost.

Oyster planting does not require a large capital, and, as it can be profitably pursued on a small scale, it is capable of supporting a very great population; but no great growth of the planting industry can be hoped for until private enterprise in this direction is rendered as safe as similar investments of labor and capital on land.

The measures which we recommend for the encouragement of planting are: First, efficient protection to planted oysters by the establishment of a clearly defined boundary beyond which no dredging shall be permitted, and by the reorganization of the oyster police, as already explained; and, secondly, such changes in the "five-acre-law" as will give to each holder of land under that law a title to his land like a title to real estate, and by a change in this law which shall give to any one who has the right to appropriate five acres under it, the right to select their five acres from any land not already appropriated, whether they contain natural oysters or not.

Another feature of the planting industry deserves notice. After this system becomes established it can be made to contribute, like real estate, to the expenses of the State by direct taxation.

The third, and by far the most important source of the oyster supply—oyster farming—is practically unknown in Maryland.

Oyster farming is the rearing of oysters from the egg, and it is therefore true farming, and as each female oyster is able to produce millions of young each year, the profits of this industry are almost unlimited.

The various methods of rearing young oysters and of establishing oyster farms are fully described in the section on this subject. The method which has been most successfully employed in America, consists in depositing clean oyster shells upon the bottom just before the spawning season for the attachment of the young, and then placing among these shells a few mature oysters to furnish the eggs and young. As soon as the young oysters, which are caught in this manner grow large enough to handle, they are distributed over the bottom, and are then watched and tended in such manner as the peculiarities of each farm render necessary.

The industry has been carried on for more than fifty years in the East river, near New York and Brooklyn, and although no oyster beds in this country have been more heavily drawn upon than those which are close to this great centre of trade and population, they have been preserved up to the present day, and are in no danger of extermination. The history of the East river oyster beds shows that the extermination of our own beds is entirely unnecessary and inexcusable.

Oyster farming is also carried on in New Jersey and on Long Island, and the State of Connecticut three years ago adopted laws which have led to the establishment of large and valuable oyster farms in her waters. These laws are given in full in another part of our report.

The industry is profitable almost beyond conception, and we are told on official authority that a crop of oysters valued at eight million dollars was raised in this way upon a French farm of 492 acres, while upon another French farm of 500 acres, 16,000,000 oysters were taken in six tides, although there were no oysters to be found when the farm was established five years before.

Ingersoll, in his "Report on the Oyster Industry of the United States," says that twenty bushels of shells laid down anywhere in Barnegat bay, New Jersey, will produce one hundred bushels of oysters, and a Connecticut writer gives the following account of the result of three years of oyster farming under the wise laws in that State:

"Fifty thousand acres of entirely barren ground covered thirty, forty and fifty feet deep by the waters of Long Island Sound have been made into productive oyster beds, and have multiplied by an hundred fold the production of native oysters. Ten years ago tens of thousands of bushels of oysters were imported from New York, New Jersey and Rhode Island, and now hundreds of thousands of bushels are yearly exported to these States and to Massachusetts. Millions of dollars are now invested in the industry, thousands of men and women are employed, millions of bushels are in growing crops and hundreds of thousands of dollars yearly come into the State as proceeds of exported oysters. The oyster authorities have paid more than fifty thousand dollars to the towns and to the State for grounds to cultivate, and pay a yearly tax to a large amount."

According to Ingersoll, 515,000 bushels of seed oysters were in 1879 taken from the Chesapeake bay to be planted in Connecticut, and three years of wise management have produced such a change that one firm shipped to San Francisco in the spring of 1883, 15,000,000 young oysters which had been reared on the Connecticut oyster farms, and were used for planting on the Pacific coast. This State is now able to sell seed oysters to the planters of adjacent States, besides sending an immense supply to Europe.

The departure of the oyster industry from Maryland to Connecticut in the near future is a certainty unless we adopt measures similar or equivalent to those which have in a few years raised the oyster grounds of that State from a position of insignificance to the front rank.

The establishment of an oyster farming industry in our waters would soon double the productive area of Maryland; it would rapidly increase the wealth and prosperity of our people; it would soon remove all danger of the loss of our oysters, and it would ultimately, by taxation, relieve the people of the interior of most of the burden of the support of our State government.

There is no measure of public policy in our State which is of greater importance to our people as a whole, or which is capable of contributing more directly to our growth and prosperity than this matter of oyster farming.

The only obstacle in the way of the development of such an industry among us is the existence of

the sentiment that since the oyster grounds belong to the whole people, they are not a proper field for private labor and industry. Sea fishes have always been regarded as common property, because it is not within the power of individuals to improve them, or increase their numbers or value, but this is not true of oysters. An oyster is as subject to improvement by cultivation as a potato, and the cultivation of oysters is, therefore, a perfectly proper and legitimate employment for labor and capital, and the common right to the beds must in time give way to private enterprise, just as surely as the common right to the natural products of the soil has given way before the progress of civilization.

Such a change as this cannot be brought about rapidly without causing great hardship; and it is therefore best that it should come slowly; but the common right of all our people to the use of the oyster beds is a very different thing from the right of a portion of our people to exterminate the beds; and since it is plain that the interest of the whole people demands an immediate change in our oyster policy, your commissioners believe that steps should now be taken to render possible the growth of our oyster farming industry in the future.

Oyster farming can be successfully carried on in shallow waters near the shore, with a small capital and on a small scale, and we believe that the changes in the five-acre law which we have recommended in the section on oyster planting are all that are needed at present for the encouragement of oyster farming in shallow water.

The cultivation of oyster farms in deep water, on the other hand, requires the investment of a large capital, and it can only be carried on to advantage on a large scale, either by the State, in areas set apart for the purpose, or by private individuals or companies, upon large tracts deeded to them for oyster farming by the State.

The question which of these methods is best can be decided only by experiment, and your commissioners recommend that the laws necessary for the trial of both plans on a small scale be passed by the General Assembly.

We recommend that a State oyster farmer be appointed, and that an area be set apart as a State oyster farm in one of the five districts which are in another part of this report recommended to be closed to the public.

We recommend that the closed district selected for this purpose be the one described in this report as "district number four," and bounded on the north by a line from Hackett's Point, E. ½ S., about three and seven-eighths nautical miles, to the south point of the mouth of Broad creek; on the east by the western shore of Kent Island, from the south point of the mouth of Broad creek to a point in range of Thomas' Point and Thomas' Point Light, and in about latitude 38° 54′ 10″ N., longitude 2° 21′ 40″ W.; on the south by a line from this point, W. ½ N., about four and one-fourth nautical miles, to Thomas' Point; and on the west by a line, N. by E., about four and three-fourths nautical miles, to Hackett's Point.

We recommend that the State oyster farmer be required to cause the bottom of the oyster farm to be shelled, and to use all other means known to him for restoring and replenishing it; and we also recommend that whenever it is opened to the public a special tax of 10 cents per bushel be laid upon all oysters taken from it, in order to repay into the State treasury the cost of farming it, as well as to exhibit the value of the measure.

We also recommend that a law be enacted giving to the oyster commissioners the power, under certain restrictions and conditions, which are explained in full in the report, to sell at auction to any citizen of Maryland the right to farm oysters upon any ground which is not already appropriated under the five-acre law, within the closed districts described in the report as "district number six," and bounded on the north by a line from the south point of Parker's Island, E. ½ N., about seven and five-eighths nautical miles, to the north point of Poplar Island, and thence E. by S. about one and one-fourth nautical miles to Cove Point; on the east by the coast line across the mouth of Knapp's Narrows to the north point of Paw-Paw Cove, on the west side of Tilghman's Island; on the south by a line from the north point of

Paw-Paw Cove N. by W. about eight and one-third nautical miles to Holland Point, and on the west by a line from Holland Point N. by W. about two and one-half nautical miles to the south point of Parker's Island.

Your commissioners believe that all the measures which have hitherto been mentioned are necessary and should become laws, and we also believe that they all should take effect immediately, although it is not absolutely necessary that they all should be adopted or go into effect at the same time.

Besides these measures, we have found it necessary to recommend a few minor changes in the existing laws, and we have embodied all our recommendations in a bill, which is given at the end of this report.

We regard the preparation of this bill as only a small part of our duty.

The resolution under which we were appointed says that we are to lay before the General Assembly such information as will enable it to devise laws for the immediate protection of the oysters.

We have therefore brought together in the body of our report, from all the sources within our reach, all the information which we have been able to obtain, and your Excellency will there find a brief sketch of the oyster industry and oyster laws of Europe, of Canada and of the Atlantic States of our own country. Our report also contains many suggestions which we have omitted from our bill, as they refer to points upon which immediate legislation does not seem imperatively necessary.

We hope that, in case the bill which we have drawn up should not be regarded as a wise one, the facts which are presented in our report will have a permanent value, and will enable your Excellency to form a clear conception of the needs of the oyster industry, and that we may thus contribute to the establishment of wise laws for its protection and development.

CHAPTER II.

The results of our examination of the beds:

While the opinion is rapidly spreading that our oyster beds are in imminent danger of exhaustion, there are many old oystermen who hold that this is untrue, and that the beds are now as rich as they ever have been. The first step in the work of the commissioners, therefore, seemed to be the accumulation, by actual examination of the beds, of such accurate knowledge of their condition as should prove to every one the truth or incorrectness of this impression, and we have therefore devoted several months to the work of examining the beds, in order that we may be able to make exact statements as to their condition. When we entered upon this work we were met by a grave difficulty, in the absence of exact information as to their condition in the past. The beds of Tangier Sound were very carefully surveyed in 1878 and 1879, by Lieutenant Francis Winslow, U. S. N., an officer of the United States Coast Survey, acting under the direction of the Superintendent. Lieutenant Winslow has published a very exhaustive account of these beds, giving their areas, boundaries, position, general character, the number of oysters to the square yard, the ratios between oysters of different ages, &c., so that we were able to ascertain without difficulty, the changes which these beds have undergone in the three years which have passed since this work was finished, but we were unable to obtain exact information of this kind regarding the great mass of the beds of this State. Lieutenant Winslow was employed for nearly two years in the survey of Tangier Sound, and a similar survey of all the oyster area of our State would require four or five years more, and as we had no means at our disposal for exact surveying, even if there had been time for us to undertake it, we adopted a more rapid method of gaining a crude idea of the condition of the beds. It is obvious that a bed where there are many oysters to the yard is in a more fertile condition than one where the oysters are few. It is also clear that a bed in which the living oysters are few as compared with the dead empty shells is less vigorous than one where the dead shells are less numerous.

It is clear, too, that a bed upon which many young oysters are growing up to replace the old ones is more prolific than one where the young oysters are few in numbers. During the first year of its life the oyster is much more exposed to accidents and enemies than it is after it reaches maturity, and it is therefore plain that, if the average life of the oyster upon our worked beds is three years, any bed upon which the oysters one year old are not much more than one-third of the whole number, must soon be destroyed.

We therefore attempted to ascertain these three points for all the larger beds in our waters: first the number of oysters to the square yard; second the ratio of living oysters to empty shells; and third the ratio of mature to immature oysters. To ascertain the number of oysters to the square yard a dredge with a mouth a yard wide was dragged over the bottom, for a measured distance, at a definite rate of speed, and its contents were then brought aboard and counted. This method does not give perfect accuracy, for the dredge does not, as a rule, take all the oysters. The number of oysters taken by the dredge varies with the weight of the dredge, the speed of the boat, the depth of the water, the length of the line, the character of the bottom, &c. Still, examinations of this sort, made upon different beds by the same dredge used by the same persons in the same boat and managed in the same manner, give results which are reliable, although it is more difficult to compare the results of two or more examiners.

The oysters captured in this way were carefully separated from the empty shells and other refuse, and both oysters and debris were measured and counted. The oyster of various ages were then separated into four sets; large oysters, or those less than 200 to the bushel; medium oysters, or those between 200

and 300 to the bushel; small oysters, or those over 400 to the bushel and over an inch long; and young growth, or those less than an inch long.

During this work we have examined sixty-one beds and have made three hundred and forty hauls of the dredge, and the results of this examination are here given in full, together with an analysis, and a comparison of our results with those which had previously been obtained by Winslow and others.

NUMBER OF OYSTERS TO THE SQUARE YARD IN MARYLAND WATERS.

In 1878 and 1879 Lieutenant Winslow examined all the beds in Tangier Sound, and ascertained that there were about .419 oysters to the square yard, or one oyster to every two and three hundred and eighty-six thousandths square yards. As the Tangier Sound beds at that time showed indications of exhaustion, this number, .419 to the square yard, is less than it would be upon uninjured beds, and it is probable that the beds outside the Sound would have given a much greater number at that time. If we now find that the average is below this number, we can safely assume that the difference is entirely due to the injury which the beds have sustained since 1879, and we can thus form some estimate of the time which will be required for their complete destruction. We have made use of the method which was employed by Winslow in his examination. A dredge, a yard wide, was dragged slowly over the bed until we ascertained that we were upon the oyster grounds. The dredge was then emptied, lowered onto the bed, and as soon as it began to take hold of the bottom it was timed, and the rate of the steamer was also ascertained by the ground log. The area dredged over was not the same in all cases. Where oysters were abundant the steamer was stopped and time was taken as soon as the dredge was full. In other cases five minutes were allowed to pass, and the steamer was then stopped. The dredge was then hauled in, and the oysters were counted and measured.

This method does not give the actual number of oysters upon the bottom, for the dredge does not always sweep clean, and it is necessary to pass over the ground several times to thoroughly exhaust it, but results obtained in this way give the relative condition of the bed with great accuracy.

Whenever the contents of the dredge showed that we were off the bed, or near its limits, the haul was not counted, and the results therefore show the number of oysters upon the beds; not the number per yard over the whole bay.

Fifty-nine beds were examined in this way, and the results are given in the accompanying table, which shows that forty-four of these beds are below Winslow's average, and fifteen above it. Upon one of these beds, in Hooper's Strait, we found 8 2 oysters to the square yard, and we here obtained 4,000 oysters in six hauls. These oysters were all very small, averaging four hundred to the bushel, and we probably struck an area where there had been a good catch of spat a year or two before, but where there were no large oysters. At any rate, this condition is exceptional, and I have therefore omitted the dredgings in Hooper's Strait in the average for the bay. Leaving this out, the average for the other fifty-eight beds gives .235 oysters to the square yard, or one oyster to each $4\frac{2}{10}\frac{3}{00}\frac{4}{0}$ yards, while three years before there was one oyster to each $2\frac{3}{10}\frac{8}{00}\frac{5}{0}$ square yards.

If we assume that three years ago the average was no more than that found by Winslow in Tangier Sound, we are compelled to conclude that in three years our beds have lost almost thirty-five per cent. of their value (.419—.225=.164: 164.÷.41900=.39=39%.) Startling as this result is, it is by no means the whole truth. We must remember that in 1879 Tangier Sound itself was more exhausted than the bay, so there were undoubtedly more than .419 oysters to the square yard at this date. Then, too, we have examined many beds where dredging is not permitted, and other beds where the oysters are unmarketable, and the high results which we obtained from these beds are included in the average. If these were omitted our total would show nearly 50 per cent. of exhaustion to the most valuable beds of the State.

Your commissioners have no desire to create a sensational effect, but the accompanying table, which is compiled entirely from the facts which they have observed for themselves by personal examination of

all the beds, must speak for itself. It is the most trustworthy evidence which we have been able to obtain, and it certainly justifies the widespread belief that the oyster property of the State is in imminent danger of complete destruction, unless radical changes in the methods of managing the beds are made at once.

Explanation of Table No. 1.

The first column gives the name of the bed; the second the number of dredgings which were made upon it by us; the third the number of square yards dredged; the fourth the number of oysters taken; the fifth the number of oysters found on each square yard by Winslow in 1878; the sixth the number found by Winslow in 1879; the seventh the number found by us in 1882; the eighth the number found by us in 1883; the ninth the amount of change in the bed between the two most recent examinations; the tenth the amount of deviation from Winslow's average for 1879, of .419 oysters to the square yard; and the eleventh the percentage of gain or loss since the last examination. Thus the first line shows that eight dredgings were made upon the Bodkin; that 1732 square yards were examined; that 894 oysters were obtained; that the bed was not examined by Winslow; that there were $\frac{8}{10}\frac{1}{0}$ oysters to each square yard in 1882 and $\frac{8}{10}\frac{0}{0}$ in 1883; that the bed had lost $\frac{5}{10}\frac{0}{0}$ oysters to each square yard since 1882, and that it has lost 62 per cent. of its value in that time.

Table No. 1.

Table Showing the Number of Oysters to a Square Yard in the Waters of Maryland.

Name of Bed.	Number of Dredgings.	Area examined, Square Yards.	Total number of Oysters.	Oysters to Square Yard.				Amount of Change.	Deviation from Winslow's average for 1879.	Percentage of gain or loss since last examination, or since 1879.	
				1878. Winslow.	1879. Winslow.	1882.	1883.			Gain.	Loss.
Bodkin	8	1732	894	....	....	.81	.305	—.505	—.114	.....	62
Sandy Point	9	2318	1164	....	....	1.21	.19	—1.02	—.229	.....	84
Hackett's Point	12	2978	3158	....	....	3.728	.234	—3.494	—.185	.....	93
Swan Point	8	1954	2333	....	....	5.22	.057	—5.163	—.362	.....	99
South Side Chester River	10	5280	189	....	....	....	.0358	.....	—.3732	.....	89
Cornfield Creek	5	1247	463	....	....	....	.371	.....	—.048	.....	13
Thomas' Point	4	1173	102	....	....	....	.089	.....	—.33	.....	79
Round Point Reef	5	3666	495	....	....	....	.135	.....	—.284	.....	67
Thomas' Bar	6	2200	205	....	....	....	.0931	.....	—.3259	.....	78
Tally's Point	7	2493	571	....	....	....	.23	.....	—.189	.....	45
Scull Hall	3	1037	231	....	....	....	.222	.....	—.197	.....	47
Chink Point	6	2200	777	....	....	....	.353	.....	—.066	.....	16
Choptank River—											
Cook's Point	5	3777	123	....	....	....	.032	.....	—.387	.....	92
Benoni's Point	2	1173	430	....	....	....	.36	.....	—.059	.....	14
Chlora's Point	1	293	40	....	....	....	.115	.....	—.304	.....	74
Todd's Point	1	733	8	....	....	....	.01	.....	—.409	.....	97
Castlehaven	1	293	6	....	....	....	.02	.....	—.399	.....	95
Horn Point	1	293	150	....	....	....	.51	.....	+.091	21	....
Total in Choptank	11	6562	757	....	....	....	.117	.....	—.302	.....	72
First Kent Point	6	2064	69	....	....	....	.0334	.....	—.3856	.....	92
South Kent Point	6	2138	119	....	....	....	.056	.....	—.363	.....	86
Eastern Bay	2	587	24	....	....	....	.041	.....	—.378	.....	90
Cox's Creek	3	487	575	....	....	1.18	....	.....	+.761	181	....
Tilghman's Point to Wade's Pt.	5	3666	186	....	....	....	.05	.....	—.369	.....	88
South River	1	293	225	....	....	....	.76	.....	+.341	81	....
Shackel's Point	1	220	190	....	....	....	.863	.....	+.444	106	....
Duvall's Bar	1	183	200	....	....	....	.1089	.....	+.67	16	....
Brewer's Point	2	513	340	....	....	....	.66	.....	+.241	57	....
Purdy's Point	1	293	165	....	....	....	.56	.....	+.141	33	....
Three Sisters	22	7313	1676	....	....	1.94	.959	—.981	+.54	.....	50
Poplar Island	8	2364	727	....	....	.69	.084	—.606	—.335	.....	87
Sharp's Island	12	1494	2809	....	....	1.33	.0981	—1.2319	—.3209	.....	90
Little Choptank No. 1	6	2200	28	....	....	....	.012	.....	—.407	.....	97
Ragged Point	6	2200	78	....	....	....	.035	.....	—.384	.....	91
Hill's Point	5	1833	80	....	....	....	.043	.....	—.376	.....	89
Nigger Head	3	1089	37	....	....	....	.034	.....	—.385	.....	91
Holland Point	12	6233	375	....	....	....	.0645	.....	—.3545	.....	84
Plum Point	6	4033	23	....	....	....	.0057	.....	—.4133	.....	98
Daddy Dare	3	1173	22	....	....	....	.019	.....	—.4	.....	95
Little Corn Point	4	1466	308	....	....	....	.21	.....	—.209	.....	49
Hog Island	6	2200	158	....	....	....	.071	.....	—.348	.....	83
Hawk's Nest	6	2200	569	....	....	....	.27	.....	—.149	.....	35
Broom's Island	6	2200	872	....	....	....	.39	.....	—.029	.....	06
Middle Ground	4	1467	339	....	....	....	.231	.....	—.188	.....	44
Kent Island	3	488	340	....	....	.7	....	.....	+.281	67	....
Kent Island	9	5463	185	....	....	....	.0765	.....	—.3425	.....	81
Potomac River No. 1	4	2787	151	....	....	....	.058	.....	—.361	.....	86
Cornfield Point to Pitt's Point	7	5133	513	....	....	....	.1	.....	—.319	.....	76
St. Mary's River	4	2787	226	....	....	....	.08	.....	—.339	.....	80
St. George's Island	4	1687	705	....	....	....	.4176	.....	—.0014	.....	3-10
Piney Point to Blackstone's Is'ld	20	7333	686	....	....	....	.073	.....	—.326	.....	79
Total in Potomac	39	19627	2281	....	....	....	.1497	.....	—.2693	.....	63
Piney Island Bar	6	976	1025	.687	.544	1.05	....	+.506	+.631	+116	....
Fishing Bay Dredging Ground	3	488	439	....	....	.9	....	.....	+.481	+114	....
Fishing Bay Tonging Ground	1	163	84	....	....	.517	....	.....	+.098	+23	....
Hooper's Strait	6	488	4000	....	....	8.2	....	.....	+7.781	+1857	....
James' Point	2	379	181	....	....	.47	....	.....	+.051	+12	....
No Point Bar	3	813	427	....	....	.52	....	.....	+.102	+24	....
Great Rock	20	5708	1555	.165	.265	.272	....	+.079	—.147	.....	34
Turtle Egg Rock	3	1626	355	.382	.295	.218	....	+0.07	—.201	.....	48
Total	326	120958	32405	....	....	....	....	.....	.....	.....	

Total number of beds examined 59
Total number of dredgings 326
Total number of square yards examined 120,958
Total number of Oysters found 32,405
Number of Oysters to the square yard ..... .267
Number of Oysters to the square yard, exclusively of Hooper's Straits ..... .235

RATIO BETWEEN LIVING OYSTERS AND DEAD SHELLS.

When the oysters are culled upon the beds where they are caught the dead shells are thrown back, and the oysters upon a bed which has been overworked will therefore form a smaller part of the total contents of the dredge than they will upon a more prosperous and valuable bed. In a dredge which has been hauled over an unexhausted bed the living oysters are many and the shells are few, while the dredge brings up from an exhausted bed a great mass of rubbish which must be lifted and handled in order to obtain a few oysters.

The ratio between the living oysters and the dead shells therefore furnishes us with a means for deciding whether a bed is deteriorating or not. This method of estimating the condition of the beds is a very rough one, and the evidence is not of much value when only a single bed is examined. The dead shells are swept into the channel in some places and covered up by sand or mud in others, so that the dredge may come up filled with shells when it happens to strike a bed where they have been swept together, and in another case, where most of the shells are buried, it may contain few shells. If the dredge is heavy and is dragged with a long line, it may dig into the mud and become filled with old shells, where another dredge, or the same dredge dragged in a different way, may contain few or none. The contents of the dredge are determined by so many accidents that single observations of the ratio between shells and oysters are of little value, but the case is different where a great number of dredgings are made. In 1876 Mr. Otto Lugger visited most of our beds, and measured the quantity of shells and of oysters obtained from each. As he made a great number of observations, his results give us a means of ascertaining the average ratio in 1876. His results, obtained by the examination of twenty beds, show that in 1876 the dredge brought up $3\frac{6}{10}$ bushels of oysters for each bushel of shells. In 1878 and 1879 Lieut. Winslow examined in the same way seventeen beds in Tangier Sound, and found that only $1\frac{9}{10}$ bushels of oysters were obtained for each bushel of shells.

In November, 1882, your commissioners examined fourteen beds in this way, and found that the average had fallen from $3\frac{6}{10}$ in 1876 and $1\frac{9}{10}$ in 1879 to $1\frac{3}{10}$ bushels in 1882. Thirty-two beds were examined in the same way in the summer of 1883, and nearly the same ratio was obtained, there being $1\frac{3}{5}$ bushels of living oysters for each bushel of dead shells.

The results of this examination are given in full in—

TABLE No. 2.

Table to Show the Number of Bushels of Oysters to Each Bushel of Dead Shells.

	1876. Lugger.	1879. Winslow.	1882.	1883.		1876. Lugger.	1879. Winslow.	1882.	1883.
Bodkin	1.22	....	.14	.46	Sharp's Island	....	....	....	.28
Sandy Point	....	....	.14	3.	Holland Point	3.	....	....	.18
Hackett's Point	....	....	1.37	4.	Plum Point	4.	....	....	4.
Swan Point	1.85	....	8.	2.	Little Cove Point	1.85	...	....	1.
Chester River	....	....	....	1.8	Hog Island	2.33	....	....	.5
Corn Field Creek	....	....	....	.89	Hawk's Nest	....	....	....	.79
Thomas' Point	3.	....	....	3.	Broom's Island	....	....	....	.52
Tally's	....	....	....	1.16	Kent Island	2.33	....	1.	.25
Scull Hall	....	....	....	4.	Piny Island	2.33	1.15	.21	....
Chink Point	....	....	....	1.57	Fishing Bay	9.	....	.28	....
Cook's Point	....	....	....	1.33	Hooper's Straits	5.6	....	2.85	....
Benoni's Point	....	....	....	1.25	James' Point	4.	....	2.	....
Castlehaven	....	....	....	.17	Sharp's Island	5.6	....	.83	....
Horn Point	....	....	....	6.	Poplar Island	5.6	....	.57	....
Eastern Bay	....	....	....	2.	No Point Bar	....	....	.1	....
Kent Point	1.5	....	....	2.	Great Rock	....	.41	.14	....
Tilghman's Point	....	....	....	.66	Turtle Egg Rock	....	1.02	.75	....
South River	....	....	....	.33	Great Fox Island	4.	....	....	....
Shackel's Point	....	....	....	.33	South Marsh Island	5.6	....	....	....
Duvall's Bar	....	....	....	.66	St. Michael's	5.6	....	....	....
Brewer's Point	....	....	....	2.5	Bozman's Flats	2.33	....	....	....
Purdy's Point	....	....	....	1.	Roaring Point	3.	....	....	....
Three Sisters	....	....	....	1.5					

In 1876 Lugger found as the average for twenty beds 3.682 bushels of oysters for each bushel of shells
In 1879 Winslow found as the average from seventeen beds 1.962 bushels of oysters from each bushel of shells.
In 1882 we found as the average for fourteen beds 1.31 bushels of oysters for each bushel of shells
In 1883 we found as the average for thirty one beds 1.4-10 bushels of oysters for each bushel of shells

This table shows that while it is necessary to handle 161 bushels of oysters and shells to obtain 100 bushels of oysters, it was necessary to handle only 151 bushels in 1879 and only 127 bushels in 1876.

This evidence, in connection with that which has been given in table one, seems to prove that the whole oyster area of our State is being rapidly exhausted.

THE RATIO BETWEEN LARGE AND SMALL OYSTERS.

Any bed is on the road to destruction if the number of old oysters which are removed from it each year is as great as the number of young ones which are growing up to take their places. Oysters, like other animals, are exposed to many accidents, and the number which can be taken from a bed annually is equal to the number which are growing up to take their places, less the number which will be destroyed by the accidents of nature.

An accurate count of the oysters of various ages upon a bed, therefore, gives us a means of deciding whether it is or is not in danger of exhaustion.

We have, therefore, examined in this way the oysters upon the beds which we have visited, and have divided them into four classes. The first class includes large oysters, or all oysters of which a bushel does not contain more than 250; the second class includes medium oysters, or those between 250 and 400 to the bushel; the third class includes the small oysters, those which are large enough to be seen and counted without difficulty, and more than 400 to the bushel; and the fourth class, or "young," those which are less than one-half inch long.

The accompanying table shows the number of oysters of each class which we obtained upon the beds which we visited, and the ratio between them.

Thus we found upon the Bodkin bar in November, 1882, no large oysters, 225 medium oysters, 355 small ones, and no young, and there were at that time 100 small ones for each 67 of medium size.

In June, 1883, we found no large ones, and the small ones which we had found in November had grown to a medium size, and there were no small ones growing up to take the places of these when they shall be removed by the season's dredging. This result seems at first sight to indicate that the fishing this season will exhaust the Bodkin bed and put an end to work there, but in truth the case is not quite so discouraging, for our second examination was made before the end of the spawning season, and an examination in the fall might have given a different result.

In order to be trustworthy, an examination of this kind should be made every year, in the same month, and if the oysters of various sizes upon each bed could be counted twice every year, in May or June, and in September or October, the results would be very valuable and would soon furnish a very exact means for ascertaining the condition of the beds. This evidence would be the more valuable, as it would soon enable us to determine, a year or more in advance, how many marketable oysters a bed could yield without injury.

In the absence of any records of the numbers of oysters of various sizes in previous years, our table is of no particular value, but we give it in full, in order to facilitate the work of comparison in the future.

TABLE No. 3.

Table to Show the Number and Ratios of Oysters of Various Sizes.

	Number of Large, or less than 250 to the bushel.	Number of Medium, or from 250 to 400 to the bushel.	Number of Small, or more than 400 to the bushel, but large enough to count.	Number of Young too small to count.	Ratio of Large to Medium.	Ratio of Medium to Small.
Bodkin, November, 1882	0	225	355	0	....	.67
Bodkin, June, 1883	0	314	0	0	....	....
Sandy Point, June, 1883	133	176	0	0	.75	....
Sandy Point, November, 1882	0	155	700	abundant.	....	.207
Hackett's Point, November, 1882	600	2,025	0	0	29	....
Hackett's Point, June, 1883	108	425	0	0	.254	....
Swan Point, November, 1882	300	2,250	0	few.	.133	....
Swan Point, June, 1883	34	49	0	0	.69	....
Chester River, June, 1883	110	79	0	0	2.14	....
Cornfield Creek, June, 1883	0	463	0	few.	....	....
Thomas' Point, June, 1883	102	0	0	0	....	....
Tally's Point, June, 1883	197	271	103	0	.727	2.63
Eastern Bay, June, 1883	13	146	53	0	.088	2.75
Eastern Bay, November, 1882	50	525	0	few.	.009	....
Tilghman's Point, June, 1883	0	101	85	0	...	1.2
Scull Hall, June, 1883	91	140	0	0	.65	....
Chink Point, June, 1883	0	777	0	0	....	....
Cook's Point, June, 1883	0	123	0	0	....	....
Benoni's Point, June, 1883	0	0	430	few.	....	....
Chlora's Point, June, 1883	0	0	40	0	....	....
Todd's Point, June, 1883	0	8	0	0	....	....
Castlehaven, June, 1883	0	6	0	0	....	....
Horn Point, June, 1883	0	0	150	few.	....	....
Choptank, June, 1883	0	137	620	0	....	.22
South River, June 1883	0	0	225	abundant.	....	....
Shackel's Point, June, 1883	0	190	0	0	....	....
Duvall's Bar, June, 1883	0	0	200	few.	....	....
Brewer's Point, June, 1883	0	340	0	0	....	....
Purdy's Point, June, 1883	0	165	0	0	....	....
Round Point Reef, June, 1883	495	0	0	0	....	....
Saunders' Point, June, 1883	0	802	0	0	....	....
Poplar Island, November, 1882	218	175	210	few.	1.24	.83
Poplar Island, June, 1883	0	124	0	0	....	....
Three Sisters, November, 1882	450	208	0	few.	1.94	....
Three Sisters, June, 1883	23	193	0	0	1.19	....
Sharp's Island Rock, November, 1882	400	900	0	many.	.44	....
Sharp's Island Rock, July, 1883	21	143	0	0	.146	....
Little Choptank, July, 1883	0	0	28	0	....	....
Ragged Point, July, 1883	0	78	0	0	....	....
Hill's Point, July, 1883	80	0	0	0	....	....
Nigger Head, July, 1883	0	37	0	0	....	....
Near Holland Point, July, 1883	0	182	0	0	....	....
Holland Point, July, 1883	0	0	193.	0	....	....
Plum Point, July, 1883	23	0	0	0	....	....
Daddy Dare, July, 1883	0	121	0	0	....	....
Steps, July, 1883	0	22	0	0	....	....
Little Low Point, July, 1883	0	308	0	0	....	....
Patuxent River, July, 1883	0	0	158	abundant.	....	....
Hawk's Nest, July, 1883	0	0	569	abundant.	....	....
Broom's Island, July, 1883	0	0	872	0	....	....
Patuxent Middle Ground, July, 1883	0	339	0	0	....	....
Thomas' Bar, July, 1883	0	0	205	0	....	....
Kent Island, November, 1882	180	160	0	0	1.12	....
Kent Island, July, 1883	22	59	10	0	.37	5.9
Bloody Point, July, 1883	45	49	0	0	.91	....
Potomac No. 1, January, 1883	0	151	0	many.	....	....
Cornfield Point, August, 1883	0	0	513	many.	....	....
St. Mary's River, August, 1883	0	0	226	many.	....	....
St. George's Island, August, 1883	0	705	0	many.	....	....
Piney Point, August, 1883	0	0	686	many.	....	....
Great Rock, November, 1882	747	407	401	0	1.83	1 01
Piney Island Bar, November, 1882	0	700	325	0	....	2 15
Fishing Bay, November, 1883	0	227	212	0	....	1.07
Fishing Bay, November, 1882	0	46	38	0	....	1.21
Hooper's Straits, November, 1882	0	0	4,000	many.	....	....
James' Point, November, 1882	0	70	111	many.	....	.63
No Point Bar, November, 1882	84	213	130	0	.39	1.60
Turtle Egg Rock, November, 1883	191	164	0	few.	1.16	....
Total	4,717	15,673	11,848	....	....	....

The precise significance of this table cannot be given until similar examinations have been carried on for a term of years, and at the same time in each year.

It will be observed, however, that it shows a total of 20,390 large and medium oysters to only 11,848 small ones. Four thousand of these small oysters were taken at one time in Hooper's Strait, in a "pocket" which had escaped the dredgers, and this haul should be omitted in order to show a typical average. If we leave it out we shall have 20,390 large and medium oysters to 7,848 small ones, or only a little more than one small one to three marketable ones. It is very probable that if all our examinations had been made in the fall, the number of small oysters would have been found much greater, and they are above the average on the beds which we examined in November.

Still the summary of the whole table shows that the beds are losing their fecundity and that the crop this winter will be greater than it will be the year after.

The reasons for the small number of young oysters we believe to be, in part, the scarcity of mature oysters to furnish spawn; in part the wanton destruction of great numbers of very young oysters through the violation of culling laws, and in part the absence of enough clean shells on the beds to furnish attachment for the spat.

There are unlimited numbers of old, decayed and dirty shells on all the beds, but on many of them we found hardly a single shell proper for the attachment of spat.

We regard the annual examination of the beds, in the way we have employed, as a matter of very great importance. In the absence of such observations it is impossible to state with perfect certainty how many oysters a bed may yield annually without injury. This examination should be made every year, during the same months, and it should be made under the superintendence of the same person, in the same way, in order that the results may admit of direct comparison. We therefore recommend that provision be made for the annual examination of all the beds under the direct control of the State. The proper time for this examination is the closed season. An examination after the year's dredging would show how many full-grown oysters remain and how many the bed might safely yield during the next season. If the examination was made late in the summer it would also show how many young oysters have become attached during the spawning season.

CHAPTER III.

THE POSSIBILITIES OF THE MARYLAND OYSTER INDUSTRY.

No one who is familiar with the history of the oyster beds of other parts of the world can be surprised at the deterioration of our own beds. Everywhere, in France, in Germany, in England, in Canada, and in all northern coast states, history tells the same story. In all waters where oysters are found at all they are usually found in abundance, and in all of these places the residents supposed that their natural beds were inexhaustible until they suddenly found that they were exhausted. The immense area covered by our own beds has enabled them to withstand the attacks of the oystermen for a much longer time, but all who are familiar with the subject have long been aware that our present system can have only one result—extermination.

The following account of the exhaustion of oyster beds in Europe is copied from Lieut. Winslow's "Report on the Oyster Beds of the James River, Va., and of Tangier and Pocomoke Sounds:"

"An estimation of the effect of excessive fishing may be formed by examining its results upon such beds in England and France as have records upon the subject. The most instructive of these are the records of the production of the beds of Cancale Bay, on the northwest coast of France, which extend over a period of sixty-eight years—from 1800 to 1868. The beds in the bay comprise an area of about 150 acres, and from 1800 to 1816 produced from 400,000 to 2,400,000 a year. This, however, was the period of the Napoleonic wars, and the fishing was much disturbed by the presence of the English cruisers. During this time the beds became so thickly stocked that the oysters were in some places a yard thick. After the close of the war the fishing improved, and the oysters were removed in larger and increasing numbers until 1843. From 1823 to 1848 it is supposed that the dredgers were living upon the oysters accumulated during the period of enforced rest, from 1800 to 1816. In 1817 the number of oysters produced was 5,600,000, and until 1843 there was a constant increase, the number taken in the latter year being 70,000,000. In 1848 it was 60,000,000; thenceforward there was a constant decrease. From 1850 to 1856 the decrease was from 50,000,000 to 18,000,000, supposed to be the effect of overdredging. From 1859 to 1868 the decrease was from 16,000,000 to 1,079,000; the oysters having almost entirely disappeared from the beds, though on account of the suffering condition of the inhabitants of the shores it was almost impossible to prevent it. In 1870 there was a complete wreck of the bottom, which could only be remedied by a total prohibition of the fisheries for several years.

"From the beds of the districts of Rochefort, Marennes, and Island of Oleron, on the west coast of France, there were taken in 1853–'54 10,000,000 oysters, and in 1854–'55 15,000,000. On account of exhaustive fishing in 1863–'64 only 400,000 could be obtained.

"According to the testimony of Mr. Webber, mayor of Falmouth, England, about 700 men, working 300 boats, were employed in a profitable oyster fishery in the neighborhood of Falmouth until 1866, when the old laws enforcing a 'close time' were repealed, under an impression that, owing to the great productive powers of the oyster, it would be impossible to remove a sufficient number to prevent the re-stocking of the beds. Since 1866 the beds have become so impoverished from excessive and continual fishing that in 1876 only 40 men and 40 boats could find employment, and small as the number is, they could not take more than 60 or 100 oysters a day, while formerly, in the same time, a boat could take from 10,000 to 12,000."

"According to the statement of Mr. Messum, an oyster dealer and secretary of an oyster company at Emsworth, England, made before the Commission for the Investigation of Oyster Fisheries, in May, 1876,

there were in the harbor of Emsworth, between the years of 1840 and 1850, so many oysters that one man in five hours could take from 24,000 to 32,000. In consequence of over-fishing, in 1858 scarcely ten vessels could find loads, and in 1868 a dredger in five hours could not find more than *twenty oysters.*

"The oyster fisheries of Jersey, in the English Channel, afforded employment to 400 vessels. In six or seven years the dredging became so extensive and the beds so exhausted that only three or four vessels could find employment, and the crews of even that small number had to do additional work on shore in order to support themselves."

In the chapter on dredging and tonging, in a later portion of this report, many facts are given regarding the former abundance of oysters in Canada and many parts of New England. In addition to these, it will be interesting to note the following facts taken from Ingersoll's Report, regarding the former abundance of oysters in New York:

In early days nearly all the creeks and inlets along the seacoast of the State of New York abounded in fine oysters, and most of the writers who described the resources of the province spoke particularly of the abundance of oysters in the immediate vicinity of the city of New York.

In 1621 "very large oisters" were too common in Nieuw Amsterdam to find a market, as all could supply themselves directly from the beds without charge, and almost without effort. In 1671 Arnoldus Montanus, and in 1681 Sir George Calvert, mention among the advantages of the new settlement oysters a foot long, in great plenty, and easy to take, and letters written about the same time contain such statements as these:

"At Amboy Point and several other places there is abundance of brave oysters."

"Oysters, I think, would serve all England."

"We have one thing more particular to us, which the others want also, which is vast oyster banks, which is the constant fresh victuals during the winter to English as well as Indians. Of these there are many all along our coast, from the sea as high as against New York, whence they come to fetch them."

Peter Kalm, who wrote upon the subject in 1748, says: "The Indians who inhabited the coast before the arrival of the Europeans have made oysters and other shell fish their chief food; and at present, whenever they reach salt water where oysters are to be got, they are very active in catching them, and sell them in great quantities to other Indians who live higher up the country; for this reason you see immense numbers of oyster and mussel shells piled up near such places, where you are certain that the Indians formerly built their huts." He also says that the oyster beds were within view of the town of New York in 1748, and that the oystermen were able to earn eight or ten shillings a day. He says that at this date the value of the oyster fisheries of the province was much more than ten thousand pounds annually.

Very much earlier, in 1679, Jasper Dankers and Peter Slyter, in a "Journal of a Voyage to New York," spoke of the abundance of oysters in the vicinity of what is now Brooklyn, and say that they found the oysters large and full, many being more than a foot long.

Even at this time New York oysters were exported to the West Indies, either pickled or fried and imbeded in a solid air-tight mass of butter, and Kalm says that in 1748 the exportation of fruit and oysters was a large and important business.

The destruction of our beds has not come upon us without ample warning.

In 1876 Prof. Möbius, a well-known German authority upon the subject, made the following prophecy: "In North America the oysters are so fine and so cheap that they are eaten daily by all classes. "Hence they are now, and have been for a long time, a real means of subsistence for the people. This "enviable fact is no argument against the injurious effect of continuous and severe fishing. As the num- "ber of consumers increase in America the price will also surely advance, and then there will arise a "desire to fish the beds more severely than hitherto, and if they do not accept in time the unfortunate "experience of the oyster culturists of Europe, they will surely find their oyster beds impoverished "through their own neglect."

In 1879 one of your commissioners called attention in the "Report of the Commissioners of Fisheries" to many facts, "which show that whether the danger of exterminating the best and most "accessible oyster beds is near or remote, it is sure to force itself upon us some time. * * * As "long as the consumption of oysters was restricted to the regions in the immediate vicinity of the beds, "the number of oysters which it would pay to gather and put into the market each season from each "bed was limited; but with the present facilities for packing and transporting oysters there is no limit "to the number which can be utilized, and the danger of destroying the best beds grows greater every "day, and keeps pace with our increasing population and with the improvements in transportation."

"If we wait until the beds are exhausted, the remedy will be slow and expensive, but prevention "of the danger in time would not necessarily be attended with any great expense."

The same report contained an appendix by Francis Winslow, U. S. N., in which he detailed the results of his examination of the beds in Tangier sound. Although his reasons for his conclusion were not the same, his conclusion, which is given in the following extract, was the same as the one just quoted. He says: "Considering the abnormal ratios between the mature and young oysters, the increased "percentage of debris in the beds, the smallness of the number to the square yard, and the decrease "in these numbers in most of the beds, together with the large number of oysters, young and old, "annually removed, I am of the opinion that, though the fecundity of the beds in Tangier sound is not "yet destroyed, it is very much impaired, and that not only are the beds rapidly and surely deteriorating "from the excessive fishery, but that their total failure is but a question of time."

Mr. R. H. Edmonds, of Baltimore, stated in the "Report on the Oyster Industry of the United States" in 1879 that "the Legislatures of Maryland and Virginia have, at every session for many years, revised and re-revised the laws upon this subject for their respective States; but have always been content to work in the dark, knowing nothing practically, and never seeing the value of obtaining full information upon so important an industry. There is, perhaps, no subject of such vital importance to either State that is so little understood."

"The present report must, at the best, be but the basis for a more elaborate and thorough scientific examination of this subject. From the chaos in which I found the business, so far as regards statistical information, I have tried to evolve some facts and figures which, by showing the importance of the trade, may cause a more careful study to be made of the means to arrest the present depletion of the beds, and provide ways for increasing the natural supply of oysters. Until this is done, it is almost useless to hope for wiser laws than those now in existence, many of which are not worth the paper upon which they are written. There are so many widely-differing interests, each seeking, through its representative in the State Legislatures, to have such laws enacted as will protect its own particular branch of the trade, regardless of what may be desired or needed by other branches, that it is utterly useless to expect to please all. Politicians, however, dependent upon the votes of the unlearned as well as the learned, must seek by all means to please their constituents, however unwise may be their desires. The carrying out of this doctrine results in a conflict of opinion among legislators, and no one being willing to relinquish his own pet theories, much time is wasted in useless discussions; and, at last, when a bill is proposed, it is subjected to so many amendments that, when finally passed, it would scarcely be recognized by its originator. In this way the laws both of Virginia and Maryland bearing upon the oyster trade, are often worse than useless; and if by chance a law should be good, the means of enforcing it, and the penalties for violating it, will be so inadequate that no good results will follow its passage.

"While dredging, properly conducted, is no doubt beneficial to the beds, I am inclined to think that it is being carried too far, and that its ultimate effect will be the same as in every European country where it has been unrestricted by proper laws. By some it is believed that the oyster beds of the Chesapeake bay are of such vast extent, and the number of young annually spawned so great, that it will be impossible to destroy them. In view of the experience of Great Britain and France, and of the almost complete destruction of many of the once famous beds of the Chesapeake, such an opinion is

without good foundation. The history of dredging in France and Great Britain is very instructive, and may be studied with much profit by those who are interested in the preservation of the oyster beds of the Chesapeake bay * * * "

"As the best stocked and most productive beds of Europe were quickly destroyed by unrestricted dredging, so may the hitherto seemingly exhaustless beds of the Chesapeake bay be depleted, if the present rate of dredging is continued. An illustration of this may be seen in the almost total exhaustion of the once famous beds of Tangier and Pocomoke sounds. Year after year these beds were dredged by hundreds of vessels, and even the summer months afforded them but little rest. The result of this has been plainly seen during the past few years, and more especially during the season of 1879–80, in the great scarcity of oysters in these sounds. Vessels have found it unprofitable to dredge in these sounds, since the oysters became so scarce, having turned their attention to other parts of the bay, and will thus give the beds a year or so of comparative rest. It is doubtful if they will ever again be as well stocked as in former years, for as soon as oysters again become plentiful, there will be a rush of all the dredging boats in the State. Thirty years ago the depletion of these beds seemed almost impossible, and yet, at the present time, it is an admitted fact that oysters have decreased at least four-fifths in Pocomoke sound and two-thirds in Tangier. If it were possible to restrict dredging so as to give every bed an occasional year of rest, the result would prove the wisdom of such a course. Owing to the great extent of the oyster beds in the bay, and their immense annual production, it may be some years before there is an oyster famine, but sooner or later it is coming, unless there is a radical change in some of the present phases of the business. Properly protected and cared for, the 'imbedded wealth' of the Chesapeake might be increased many fold. It is a shame that the gifts so lavishly bestowed by nature upon Maryland and Virginia should receive so little practical appreciation."

There has been no lack of warning, nor can our people plead ignorance of the true remedy. In the paper which is referred to above one of your commissioners discussed at considerable length and warmly recommended a plan which was employed two years after by the people of Connecticut on a very extensive scale, and with such good effect that the oyster grounds of that State have been raised in three years from a position of insignificance to the front rank.

If the importance of shelling our oyster bottoms with dead and clean oyster shells had been recognized at the time when we recommended this practice, and if the laws which are needed for its encouragement had then been enacted, our oyster supply would now be in no danger of exhaustion.

The recommendation met with no attention, as it was looked upon as the *unpractical* view of a student; but our people may perhaps be able to learn from the *practical* example of Connecticut what they would not learn on the authority of a scientific paper.

If we do not it is safe to hazard another scientific prophecy and to point out that as our supply fails the oyster farmers of Connecticut are ready to bid for the business of supplying the market; that after the invested capital of the packing business has once departed from our State the practical shrewdness and industry and intelligence which have taken it away from us will be perfectly able to hold and retain it in opposition to anything we can do to the contrary.

It rests with our people to decide whether they will wait for this practical lesson or not. In some cases it is worth while to shut the stable door after the horse is gone. Our experience of last winter shows that even when the enactment of laws enforcing vaccination has been neglected until the outbreak of a smallpox epidemic, it is not even then too late to benefit the survivors; but after the Yankee fishermen of Connecticut have once got the oyster business into their own hands, they will be more difficult for us to handle than the smallpox.

Our people should also be awakened to a sense that interest in the matter is not confined to the fifty or sixty thousand persons who now live by the oyster business, or even to those who value oysters as food. It directly influences the welfare of all of us and our posterity, for our oyster beds are our greatest source of wealth, and upon them, more than upon our commerce, or our manufactures, or our farming lands, the future wealth and prosperity and population of our State depend.

Every one appreciates that it is for his interest to get his little private supply of oysters as cheaply as possible, but scarcely any one, except the oysterman, realizes that this is the least of his interests in the matter. If our population were increased fifty fold, the oysters needed for home consumption would even then be only a small part of the supply which our waters can be made to furnish, and every one who is interested in Maryland, all business men who will be benefitted by an increase in wealth and population, all farmers who pay taxes to the State, and all persons who own property here, should awaken to the fact that our greatest source of wealth is almost absolutely undeveloped.

The wealth which is within the reach of our people and their descendants from the oyster grounds of the State is great, almost beyond expression, and it is not too much to affirm that the money value of the grounds under the water is equal to that of the dry land.

One of your commissioners has attempted to form a rough approximation to the area which is at present occupied by oysters in Maryland, and while, in the absence of exact surveys, the result cannot be regarded as strictly accurate, his conclusions, which are given in the following table, are certainly not excessive.

TABLE No. 4.

Areas of Oyster Beds Approximately Ascertained.

	Square Yards.		Square Yards.
Fishing Bay Beds	25,600,000	Brought forward	136,587,200
Were Point	1,800,000	Calvert County Bay Shore	57,076,800
Shark Fin Point	1,850,000	James River to Islands to Boundary Line	42,240,000
Nanticoke Point	3,400,000	Anne Arundel County Bay Shore	88,281,600
Clump Point	400,000	Kent County Bay Shore	21,608,400
Horsey's Bar Beds	200,000	Talbot County Bay Shore	50,372,800
Tyler Beds	700,000	Queen Anne's County Bay Shore	48,787,200
Drumming Shoal	2,400,000	Susquehanna River Oyster Beds	14,700,000
Cow and Calf	300,000	Sassafras River Oyster Beds	3,300,000
Bloodsworth Island (East Bed)	4,000,000	Back River Oyster Beds	2,200,000
Cedar Beds	400,000	Back River Oyster Beds	1,200,000
Mud Beds	1,800,000	Gunpowder River Oyster Beds	3,800,000
Turtle Egg Island	1,650,000	Bush River Oyster Beds	1,300,000
Chain Shoal	1,200,000	Hawk Cove Oyster Beds	960,000
Muscle Hole Bed	3,000,000	Patapsco River Oyster Beds (Old Road River to Sollers' Point)	3,800,000
Piney Island Bar	7,000,000		
Manokin River Bed	6,200,000	Chester River and Creeks Oyster Beds	21,400,000
Big Annemessex	3,000,000	Bodkin Creek Oyster Beds	5,000,000
Harris' Beds	3,400,000	Magothy River Oyster Beds	8,900,000
Terrapin Sand Beds	1,400,000	Severn River Oyster Beds	3,500,000
Paul's Bed	800,000	South River Oyster Beds	6,000,000
Woman's Marsh	7,000,000	Eastern Bay and Creeks Oyster Beds	19,400,000
Bed of Janes' Island	1,800,000	Choptank River to Cambridge Oyster Beds	13,300,000
Great Rock	8,500,000	Little Choptank River Oyster Beds	7,100,000
St. Mary's County Bay Shore	48,787,200	Patuxent River to Benedict Oyster Beds	17,300,000
Carried forward	136,587,200	Total	578,224,000

Five hundred and seventy-eight million square yards are about one hundred and ninety-three square miles, or one hundred and twenty-three thousand five hundred and twenty acres.

As Winslow found, by actual survey, that there are 103 square miles of natural oyster beds in Tangier Sound alone, this estimate of 193 square miles for our whole territory is certainly not excessive, and it will be noticed that the Potomac river is not included in this estimate.

We show in another part of our report that only a very small part of the bottom which is proper for oyster farming is now occupied by natural beds, and it is safe to estimate the total area of valuable oyster ground in our State at one thousand square miles, or six hundred and forty thousand acres.

Much of this ground could be made to yield to its cultivators an annual profit of $1,000 per acre, and the profit on the whole, under a thorough system of cultivation, would not be less than $100 per acre. It is not too much to affirm that when the whole of this area shall have been developed, the future citizens of our State will be able to draw an annual income of over sixty million dollars from our waters.

At present, however, their value is very much below this estimation, and under the present system of management it is rapidly disappearing altogether. The oyster crop has never been very much more than 10,000,000 bushels, and its value to the fisherman has never, in all probability, exceeded $2,000,000. It is not easy to ascertain its precise value with great accuracy, but $2,000,000 annually is a safe estimate, and the actual annual value of the oyster beds, under a system which is rapidly leading to their complete destruction, is thus seen to be less than three per cent. of their possible value.

An abstract statement in figures is always open to distrust, and in order to guard against any impression that the value stated above for our oyster grounds is imaginary, we wish to call attention here to what has actually been realized in other places.

The oyster beds of Rhode Island were long ago so depleted that they have long ceased to be of any value as a source of food, and there is now only one river in the State where seed oysters for planting can be procured in any quantity.

A few years ago laws were passed to foster and develop the planting industry, and in 1879, 962 acres of planting ground were occupied under this law, and notwithstanding the fact that nearly all the seed oysters must be purchased outside the State, these 962 acres yielded in 1879 oysters which were sold by the cultivators for $680,500.

We hope to show further on that oyster-planting is by no means the most profitable use to which our grounds can be put, but a simple computation will prove that if all our grounds were used for this purpose and were no more profitable than those of Rhode Island, our 640,000 acres would annually yield to their cultivators nearly five hundred and fifty million dollars.

There is no fear that the market will ever be overstocked with a cheap and nutritious article of food like the oyster; and as improvements in the method of packing and transporting oysters are introduced, the demand for oysters to supply the rapidly increasing population of the United States will fully tax all the resources of our waters, to say nothing of the demand from Europe.

The greater part of our report is devoted to an explanation of the means which can be employed in order to develop the resources of our oyster grounds, but this is all that lies within our power.

It rests with the people of Maryland to decide whether these resources shall be developed, and until we are prepared to avail ourselves of our natural advantages, and reap the harvest which lies within our reach, nothing can be accomplished.

Our present oyster policy has had a thorough trial, extending over a long term of years, and we may therefore ask now, with perfect propriety, what it has accomplished. We believe that any one who is in the position to view the subject from all sides, or any one who will candidly weigh the facts which are detailed in this report, will acknowledge that the following is a just answer to this question:

Under our present policy our beds have yielded about ten million bushels of oysters a year, from grounds which are capable of yielding over five hundred million bushels annually.

Our present policy has resulted in the destruction of some of our most valuable beds, and in the serious injury of all of them, while other States have greatly increased the value of their beds at the same time that they have increased instead of restricting the fishing.

It has paid a profit of less than 100 per cent. annually upon the capital invested in the business, while money thus invested in other States has paid an annual interest of more than 200 per cent.

It has given employment to about fifty thousand of our people for part of the year, while our grounds should give profitable employment to five hundred thousand people for the whole year.

It has done nothing to encourage migration into our State, although our natural advantages, if they could be utilized, would draw to us a very desirable class of emigrants.

It has paid our oystermen about two million dollars a year, although our grounds should pay to their cultivators over sixty million dollars a year.

Over six hundred thousand acres of oyster ground has paid to the State treasury about fifty thousand dollars a year, and it has paid about ten thousand dollars a year to the school fund, while the Gov-

ernor of Rhode Island reports that his State will this year receive a revenue of over eleven thousand dollars from eleven hundred acres of oyster ground, none of which is so valuable as that of our State. On the same basis our revenue should be more than six million dollars a year.

The interests of the people of our State, therefore, demand a complete change in our oyster policy; but as your commissioners believe that hardships to a few should outbalance benefit to many, we hesitate to recommend any sweeping change, and we have, therefore, attempted to devise a plan which shall open the way for improved methods, and shall also protect the rights of those who are now engaged in the business, and shall preserve the beds from complete destruction until a new system shall be gradually introduced.

The statement that the public treasury of Maryland receives over fifty thousand dollars a year from the oyster ground seems, at first, to imply that the oyster industry contributes to the general expenses of our government, but more careful examination shows that this is not the case. The revenue is not only very much less than it should be, but the cost of collecting it is in excess of the receipts. In proof of this we refer to the following table of receipts and expenses from this source between 1878 and 1883.

It will be seen, from this table, that while the receipts for the past five years have been the very considerable sum of $210,332.24, the expenses have been $217,753.07, or $7,420.83 more than the revenue:

TABLE No. 5.

Statement of the Receipts and Expenditures of the State on account of the Oyster Industry.

YEARS.	RECEIPTS.			EXPENSES.							Total Receipts.	Total Expenses.	Net Revenue.	Net Expense.
	From State Dredging Licenses.	Oyster Measures.	Oyster Fines	Salaries.	Supplies.	Repairs.	Advertising.	Cost of Suits	Purchase of Boats.	Painting Numbers.				
1870–71	$41,587 46													
1871–72	39,039 62													
1872–73	52,312 69													
1873–74	30,227 73													
1874–75	42,355 58													
1875–76	48,468 68													
1876–77	49,837 46													
1877–78	37,408 39													
1878–79	31,173 29	$445 50	$ 350 33	$26,641 60	$6 137 06	$1,143 00	$39 61	$418 46	.....	.....	$31,969 12	$44,379 76	.....	$12,410 64
1879–80	18,806 50	227 70	576 84	33,926 26	5,202 07	.....	61 59	420 20	$2,000 00	$171 85	19,611 04	41,784 97	.....	22,173 93
1880–81	40,589 98	386 10	3,949 63	27,548 45	10,259 28	.....	53 35	413 54	.....	129 00	44,925 71	38,403 62	$ 6,522 09	
1881–82	52,582 05	346 50	4,822 50	27,560 98	8,045 79	.....	27 90	304 72	2,500 00	631 20	57,751 05	39,070 59	18,680 46	
1882–83	48,841 64	326 70	6,906 98	29,743 50	11,038 13	.....	106 85	426 65	12,500 00	299 00	56,075 32	54,114 13	1,961 19	
		1878—1883	1878—1883	1878—1883	1878—1883	1878—1883	1878—1883	1878—1883	1878—1883	1878—1883				
Total,	$533,231 07	$1,732 50	$16,606 28	$155,420 79	$40,682 33	$1,143 00	$289 33	$1,983 57	$17,000 00	$1,234 05	$210,332 24	$217,753 07	$27,163 74	$34,584 57

Net expense of Oyster Industry, from September 30, 1878, to September 30, 1883..... $7,420 83
Balance due the Oyster Fund by the Treasury proper, September 30, 1878.....$247,562 23
Balance due the Oyster Fund by the Treasury proper, September 30, 1883.....$240 146 40

Balance reported as due by the Comptroller of the Treasury, September 30, 1883 ..... $239,946 40
Error in Balance carried forward in Comptroller's Statement, September 30, 1881..... .... $200 00

$24,

The statements which we have made above regarding the profits of capital invested in the oyster business here and elsewhere, are based upon computations which have been made by Mr. W. B. Hopson, the editor of the "Sea World and Packers' Journal" of Baltimore.

In the issue of November 25, 1882, Mr. Hopson gives tables, chiefly compiled from the Report of the U. S. Census for 1880, to show the amount of capital invested in the business, and the number and value of the oysters, and he summarizes his conclusions in the following words:

"The Middle States have some $4,871,000 of capital embarked in the fisheries, employ over 19,000 persons, and return a gross income of nearly $9,000,000.

"The Southern Atlantic States have invested over $8,000,000 of capital, employ 57,000 persons, and collect a gross income of $9,562,000.

"It will be noticed that while the Southern fisheries have nearly twice the capital invested and employ three times as many persons as the Middle States, yet the income returned is only one-eighth more than that of their Northern competitors.

"The gross income of the oyster fishery in the Middle States is 204 per cent. of the invested capital, while in the Southern States it is only 94 per cent.

"To sum up this distressing exhibit, statistics show that one oyster from the Middle States is worth four from the South; that to get those four oysters, or one for that matter, the Southern fishery uses from two to three times as many men as their neighbors and rivals; and that notwithstanding the immense yield of the Southern fishery, it pays not half so much in gross income as that of the Middle States, and that out of this must come the wages of double the number of employees."

CHAPTER IV.

THE CAUSE OF THE EXHAUSTION OF THE BEDS.

While the reason for the exhaustion of our beds is perfectly clear and simple, the greatest ignorance upon this point exists in the minds of our people. It is not essential that a patient should know the nature and cause of his disease, but this knowledge is of the greatest importance to his physician, and it is of equal importance that the men who are called upon to legislate for the preservation of our oysters should clearly understand the true reason for their destruction.

We state, then, in capital letters, that our beds are in danger,

BECAUSE THE DEMAND HAS OUTGROWN THE SUPPLY.

There are only two possible remedies. Either we must diminish the demand by killing the packing industry which has created it, or we must increase by artificial means the natural supply of oysters.

Even if our natural beds could be restored and placed as they were twenty years ago, this would only delay for a few years their final exhaustion, for the demand is now far beyond the natural productive powers of our waters, and it is growing greater every day.

The daily papers for the last year have published, nearly every day, letters from oystermen who believe that they can point out the true remedy, and the proposed remedies are almost as numerous as the authors, and nearly all the letters give statements which, while they are perfectly true, are based upon such narrow experience that they are of little or no value as contributions to a broad, comprehensive view of the problem.

The tongmen know that most of the oysters have been taken away by the dredgers, and they, therefore, advocate the prohibition or restriction of dredging. Ignorant of the fact that in localities where no dredging has been allowed, the natural beds have been exhausted by tongmen, just as soon as a demand for the oysters sprung up, they believe that the prohibition of dredging is all that is needed to restore the beds. The dredgers, on the other hand, attribute the injury to the law which allows the tongmen to take oysters for private use in the summer, forgetting that the beds of Connecticut are rapidly increasing in value under a law which allows not only tonging, but dredging as well all through the year. The small dredgers and scrapers hold that the larger vessels are destroying the oysters by the use of heavy dredges, although the Connecticut farmers find it to their interest to use on their own private beds, far heavier dredges, which they drag over the beds by steam.

Many of the oyster packers, who carry on their business only in the winter, believe that all the damage is due to the oystermen who fish in March, April and May, and men who have money invested in the oyster business in Maryland, believe that the exportation of oysters in the shell, and especially oysters for planting in Northern waters, is the cause of the mischief.

All agree in throwing the blame on some one else, and all believe that some form of the business in which they are not interested is responsible for the present state of things, and should be prohibited, but as the oyster navy is a convenient scape-goat, all parties unite in throwing the blame upon the officers of the Fishery Force.

Certain writers attribute the destruction of the oysters to disease, like the pious oystermen of Wellfleet, on Cape Cod, who, after they had exterminated their oysters by over-fishing, laid their loss upon Providence, which had, they said, punished them for their sins by inflicting a fatal disease upon the innocent oysters.

Some of the explanations of the destruction of the oysters come from persons who have enjoyed such opportunities for observation and study of the subject that broader views might fairly be expected from them.

Thus, to explain the disappearance of oysters from the New England coast, north of Cape Cod, a well-known conchologist, Dr. Gould, says that he does not believe there were ever any oysters there, while a very eminent naturalist, Prof. Verrill, holds that the climate of New England has undergone a change within the last century or two, and that it is now too cold for oysters, although a few scattered oysters are found there still, and although they are still abundant at some points on the much colder coast of New Brunswick, and although we have the minute accounts which the early settlers have given us of the gradual destruction of their oysters as the population increased.

We can hardly be surprised that our people should exhibit total ignorance of the true cause of the destruction when we recollect that there is not a single word in any of the laws of Maryland which indicates that our legislators are aware that the supply of oysters can be artificially increased, or that there is need for any such increase.

The contrast between the views upon the oyster question, which are now prevalent among our people and those which come from a broad-minded consideration of the question in all its relations, can be illustrated by an example. The uncivilized Indians are able to supply all their wants from the natural resources of their hunting grounds, but as population increases, food grows scarcer and hard to procure, and it soon becomes evident that the natural supply is not enough. The first impulse, in such an emergency, is to restrict the demand, by driving away or starving out the superfluous population; and if savage tribes were able to enact and enforce laws, they would no doubt try to preserve their game by laws restricting the quantity to be killed, or by laws forbidding the use of improved appliances for capturing it.

Civilized races have long recognized the fact that the true remedy is not to limit the demand, but rather to increase the supply of food, by rearing domestic sheep and cattle and poultry in place of wild deer and buffaloes and turkeys, and by cultivating the ground instead of searching for the natural fruits and seeds of the forests and swamps.

It is not in a spirit of harsh criticism, but in the hope that our people may be awakened to their own interest, that we point out the similarity between the views of our people and their legislators and the opinions of savage races. We live in a highly civilized age, and if we fail to grasp its spirit we shall go to the wall before the oyster cultivators of the Northern States, just as surely as the Indians have been exterminated by the whites. We cannot resist the progress of events, but we can control it if we will be wise in time.

Two gentlemen, who are qualified by an extensive experience with our own fisheries and those of other States, have lately published their views upon the subject, and these views form a striking contrast to those which have just been referred to.

Lieut. Francis Winslow, United States Navy, is a well-known authority upon the oyster question, as he has devoted several years to the study of our beds and of all the various aspects of the oyster industry in all parts of our State, as well as in other States and in Europe.

He has recently published the following expression of an opinion, which is identical with the one we have given above—that the demand has outgrown the supply.

He says "Not only must the fecundity of the beds be preserved, but the market supply must also be kept up to the present demand, if not actually increased; and is a cessation of dredging likely

to accomplish the latter end, when at present the vast fleet of pungies and canoes are straining every rope and windlass and openly violating every law of two powerful States in order to find oysters in the required numbers? The truth is that the Chesapeake beds are no longer equal to the demands made upon them. Some policy must be adopted which will supplement the supply granted by nature, or else prices will surely rise."

"No mere restriction of the fishing can possibly accomplish the desired end. It may prevent the extinction of the beds as they are now, though that is doubtful. It certainly will not relieve in the least the present condition of the market. What should be done is to adopt a policy similar in essential features to that of Connecticut. The fishery of that State is one of the few instances of recuperation on record. I know of many destroyed oyster fisheries, and I know of a few that have been rebuilt, and I find one cause common to all failures and as common to all successes. In the first instance, the fishery has been common property, its preservation everybody's business—that is, nobody's—and consequently it has not been preserved. In the second instance, the fishery has been conducted and owned by persons singly and together as private property; it has been this, that or the other man's business to see to its preservation; that is, its preservation has been everybody's business instead of nobody's, and consequently it has been preserved."

"Maryland cannot escape the action of universal laws, and the sooner those interested in the matter recognize the fact, and that a man does best by his own, whether it be a wheat or oyster farm, the sooner will a correct conclusion be reached regarding the oyster question."

"*Baltimore Sun, Dec. 3, 1883.* FRANCIS WINSLOW, Lieut. U. S. N."

Mr. W. B. Hopson, the editor of the "*Sea World*," of Baltimore, is also familiar with the subject in all its varied aspects, and he has recently expressed the following opinion:

"Now, as to the cause of depletion, we must find that the rapid growth of the business of oyster packing, facilitated by improved means of transportation, is the cause, made possible by the entire absence of proper laws or license to foster the natural resources of the beds. Ignorance and local prejudice alone stand against this statement and take refuge in the exploded theory of "over-fishing." Whether designedly or ignorantly, all who give study to the subject are in conflict with science, practical experience and the most careful examinations of the beds and mode of catching in the assertion that "over-fishing" depletes the beds upon any other principle than an annual increase of the oyster industry, and the absence of any cultivation to recuperate them. Scientific investigation has proven that what has fostered the industry in the waters of other States, and annually added to their value, has, in the presence of a superior climate in our waters, a larger possibility by thousands. While, then, too many oysters are taken in winter because of the want of cultivation to reproduce them, we look to such remedies as will arrest the depletion. Where else shall we look for efficient remedies if not to those sections where the most satisfactory and remunerative results have been obtained? The natural supply of oysters has been as great as it ever will be, and proving insufficient for the growing demand, the favorite theory of closing certain districts to dredging will not afford a desirable remedy. Oyster farming, which has been successfully pursued in northern waters, must now or hereafter be employed to bring about satisfactory results. There is no contrary opinion which can stand against this proved remedy. If the question of what was best to do and what was possible rested entirely upon the theories of men, the simple law of propagation would be found at variance with the theory that the natural beds, in the condition that they now are, could reproduce commensurate with the continually growing demand. When the minute study of the reproductive possibilities of the oyster, with the conditions necessary thereto, is backed by practical and profitable experience, of which we have so often furnished proof; when facts of unquestionable success in cultivation are easily attainable

it does seem for the salvation of the oyster industry a whole army of fool-killers were necessary in our midst."

The emergency can be met by legislation to prohibit dredging and wholesale fishing, and to drive the oyster business out of our State, but we can hardly conceive a greater misfortune to our people than this would be. Still, if this were the only way to preserve our oysters, we should be the first to recommend it, and thus preserve for the people of our tide-water counties the supply of cheap food which nature has placed within their reach; but fortunately this is not the only remedy, and it is quite possible to increase our annual supply of oysters many hundredfold.

The ignorance of our people regarding the means which must be employed for this purpose, and their prejudices upon the subject, are so great that this cannot be done immediately, and it is therefore necessary for us to do all that can be done to preserve our present resources, and to keep our beds from complete destruction until our natural supply can be supplemented by artificial methods.

We shall, therefore, divide the rest of our report into two parts, and we shall examine, first, what can be done under our present oyster policy to preserve our natural beds; and, secondly, we shall try to point out the way in which our supply can be increased.

CHAPTER V.

On the Means which are Necessary to Arrest the Destruction of our Natural beds.

Section 1.—On the Wanton or Unnecessary Destruction of Oysters, and on the Protection of Young Oysters, and the Restoration of Oyster Shells to our Waters.

One explanation which has been urged to account for the destruction of our oyster beds is the wanton or unnecessary destruction of young oysters. Upon the piles of shells which are thrown out from the packing houses, great numbers of young shells can often be found. They are, of course, dead, and as they are too small to be of any use, their destruction is a clear loss to our people. It is impossible to prevent this from happening occasionally, as in many cases the little oysters are so small and so firmly fastened to the old one, that they cannot be removed without destroying them, and even if the oystermen could be compelled to throw back into the beds any large oyster which has small ones fastened to it, there is reason to doubt whether this would be advantageous, for one full-grown oyster, like a bird in the hand, is more valuable than two small ones which may or may not grow up to maturity. We believe, however, that in cases where great numbers of young are fastened to the large ones, the use or destruction of them at the packing house should be discouraged. This difficulty will disappear with the growth of the planting industry, for small oysters will then be valuable as seed, and they will pass into the hands of the planters instead of going to the packing houses. The true remedy, therefore, is the encouragement of planting, and if our people would develop this business immediately, all need for special legislation would disappear.

There is little hope that this will be done immediately, and the question whether the consumption or destruction, by the packers, of immature oysters, should not be prohibited by law presents itself for discussion. Your commissioners believe that such a law should be passed, if any means of enforcing it can be provided, and we therefore recommend that if any dealer in oysters for food shall have in his possession any oysters so small that a bushel measure, as defined by law, will contain more than three hundred, he shall be made liable to a fine of $1 for each bushel, and we also recommend that the commanding officers of each of the police steamers shall inspect the oysters at each of the packing houses in his district, at least twice in each season, for the enforcement of this law.

The destruction of young oysters at the packing houses is trifling, however, compared with that which results from violations of the culling laws. When a dredge is brought up from an oyster bed, it usually contains a few marketable oysters and great quantities of empty shells, which are often covered with young oysters. The law requires that these shells shall be thrown back upon the beds where they are taken, under a penalty of three years' imprisonment, or three hundred dollars fine, or the forfeiture of the boat used, but the enactment of this law has failed to remedy the evil. It is and always must be very difficult to enforce a culling law, and as the captain of a dredging boat wishes to improve his time on the beds to the best advantage, and to make the most of pleasant weather while it lasts, it is, of course, to his interest to fill his boat as quickly as possible, and all hands are therefore so fully employed in catching oysters that there is no time to cull them. Even when a captain is disposed to cull on the beds, he may be compelled, by stormy weather, to run for harbor, and will then employ his crew in culling the oysters while lying in harbor. The shells are then dumped overboard in heaps around the anchorage, and even if the bottom should by chance be favorable for the growth of the oysters, they are smothered and killed under the heaps of shells.

The only way in which this can be prevented is by making it to the interest of the fisherman to save rather than to destroy the small oysters, and this can be done by the encouragement of planting. There is enough suitable ground under our waters to rear to maturity all the seed oysters which the natural beds can yield, and the time is sure to come when it will not pay the fisherman to destroy those which cannot be sold to the packers, and it will not be necessary to legislate for their protection.

The penalty for the violation of the present law is severe enough, and we do not recommend any new or additional penalty.

The aim of the culling law is twofold: first, to preserve the young oysters, and secondly to compel the return of the dead shells to the beds, that they may serve for the attachment of spat.

The value of these shells for this purpose is not very great, as they are usually decayed and slimy and covered with sponge, but it is undoubtedly true that they are sufficiently valuable to justify the culling law. The dry, clean shells which accumulate at the packing houses during the winter are far more valuable, and if these could be returned to the beds in the summer a great increase in fertility would certainly follow.

The improvidence of the people of the United States in dealing with their oysters, so long as they were abundant, has been almost beyond belief. The early settlers found at their doors a supply which they regarded as inexhaustable, and they not only used them freely as food, but they also spread them upon their fields as manure, and poured them, alive, into their lime-kilns and iron furnaces. In the Northern States the beds soon showed signs of exhaustion, and these practices were prohibited by law.

New Jersey enacted laws in 1775, in view of the fact that "A practice hath prevailed of raking and gathering great quantities of oysters with intent to burn the same for lime only, whereby great waste is made, and the oyster beds thereby in danger of being entirely destroyed," and prohibited this practice under heavy penalties, and in 1847 the same State imposed a fine of $50 for gathering oysters to be used in the manufacture of iron.

Mr. Earle, of the U. S. Fish Commission, states that no longer ago than 1879, the oystermen of Pamlico Sound, in summer, when the weather became too warm for them to safely carry their oysters to market, were in the habit of catching "coon oysters," and carrying boat loads of them up the rivers to the farmers who purchased them for from 3 to 5 cents a bushel and used them for manure.

In Maryland we have no general law forbidding these practices, although there are several local laws, such as the law of 1868, imposing a fine of $500 upon any one who takes oysters in Worcester county for the purpose of converting them into lime, and the law which imposes a fine of $10 upon any one who catches oysters for manure in Somerset county, or any person in said county who purchases oysters for manuring land from any person who shall have caught them in the waters of said county. The wording of the law seems to have been designed to permit the residents of this county to purchase, outside the county, oysters to be used for manure; and therefore suggests that a State law may be necessary.

We therefore recommend that a law be passed prohibiting, under a penalty of three years' imprisonment, for each offence, the taking, or sale, or use of oysters as manure, or to be burned in lime kilns, or to be used in the manufacture of iron.

THE RETURN OF SHELLS TO THE BEDS.

As it has taken our people nearly two hundred years to discover that we cannot afford to destroy oysters in this way, we can hardly expect them to perceive that clean, empty shells are also so valuable that their use for lime, &c., should be prohibited.

One of your commissioners called attention to the very great value of oyster shells in 1879, in an appendix to the report of the Fish Commission, and showed that a great increase of fertility would follow the return of the shells to the waters of our bay. The history of the Connecticut oyster fish-

eries for the last three years shows that if this advice had been followed our beds would not now be exhausted, and we therefore quote the passage, from page 29, of the "Report of the Commissioners of Fisheries of Maryland for 1880," in which this advice was given, together with the reasons for it:

"As the young oysters swim to and fro in the water they are carried to great distances by the "tides and currents, and reach all parts of the region of water in which the parent bed is situated. In "a favorable year a floating plank or bush, or piece of driftwood will be found to become covered "with small oysters which have fastened to it, although it may not be within miles of any natural "oyster bank. The fact that the young may be collected in this way in any part of the Chesapeake "bay shows that the young oysters must settle down upon the bottom in nearly all parts of the bay, "and we should expect the adults to have an equally general distribution.

"This is far from the case, and nothing would be farther from the truth than the idea that the "bottom of the waters of the oyster region is uniformly covered with oysters, and that it is only neces- "sary to throw a dredge overboard and drag it along the bottom for a short distance in order to bring "it up full. Nothing could be a greater mistake, for both in this country and in Europe the oysters "are restricted to particular spots, "beds" or "banks," which are as well defined and almost as sharply "limited as the tracts of woodland in a farming country. These beds are so well marked that they "can be laid down on a chart or staked out with buoys, and even in the best oyster regions they occupy "such an inconsiderable part of the bottom that any one ignorant of their position would have very "little chance of finding oysters by promiscuous dredging. Although the young are distributed "every year, by tides and currents, to all parts of the bottom, the dredge very seldom brings up even "a single oyster outside the limits of the beds.

"The restriction of the oysters to certain points does not appear to depend upon the supply of "food nor upon the character of the water, but almost entirely upon the nature of the bottom. The "full-grown oyster is able to live and flourish in soft mud, as long as it is not buried too deeply for "the open end of the shell to reach above the mud, and draw a constant supply of water and food into "the gills. The placing of adult oysters upon such bottoms at convenient points, to "fatten" for the "market, is a well-known practice. The oyster embryo would be engulfed and smothered at once if it "should settle down upon such a bottom, and in order to have the least chance of survival and long "life the young oyster must find some solid substance to fasten itself to, in order to preserve it from "sinking in the soft mud or from being covered by shifting sand or gravel. As soon as the young "oyster finds such a solid body, rough and clean, it fastens one valve of its shell to it, by secreting a "cement of shelly matter around the growing edge. The living and dead shells of the adult oysters "furnish the best surfaces for the attachment of the young, and for this reason the points where "oyster beds are already established are those where the young have the most favorable surroundings "and the best show for life, and the beds thus tend to remain permanent and of substantially the same "size and shape.

"At the time of attachment the shell of the young oyster is still very thin and delicate, and the "animal falls an easy victim to the numerous enemies which abound upon the oyster beds, such as crabs "of various sorts, carnivorous gastropods and various fishes. It is not an uncommon thing for fifty or a "hundred "spat" to attach themselves to one full-grown shell. Some of them are killed by enemies "and others are crowded out, so that only a few grow up at the expense of the others, and the number "which survive is astonishingly small. * * * * * * * *

"It is well known that shell fish of all kinds thrive best where the supply of lime is greatest. "The fresh water mussels, which live in streams and ponds where the supply of lime is scanty, grow "slowly, and their shells are so thin that they are very subject to accidents, and their numbers are "limited; but in limestone regions the shells are large and heavy, and the bottoms of the streams are

EXPLANATION OF PLATE I.

FIGURE 1.—An oyster shell upon the inside of which about one hundred and fifty young oysters have fastened themselves. This is one from the lot of shells which were sold by Mr. Church, of Crisfield, from the pile of shells at his packing house to an oyster farmer in Long Island Sound. Mr. Church visited the farm five weeks after the shells were shipped, and took up a number of the shells, and he states that the one which is here figured is a fair sample.

FIGURE 2.—An adult oyster, natural size, from Bird Bed, in Pocomoke Sound. Copied from Winslow's "Report on the Oyster Beds of the James River, Va., and of Tangier and Pocomoke Sounds."

FIGURE 3.—A pipe, upon the bowl of which six oysters have grown; from the Chesapeake Bay.

Figure 3.

Figure 2.

Figure 1.

"almost paved with mussels, and it is well known to conchologists that corel reefs and islands are the "most favorable regions for the abundant growth of all kinds of shelled molluses.

"The dead oyster shell is soon corroded, and in a few years entirely dissolved by the sea water; "and I think this fact is another reason why the young oysters thrive best on a natural bed.

"How far the supply of oysters is limited by the supply of lime it is impossible to say; but when "we recollect how important it is that the young oysters should soon find solid bodies to fasten them- "selves to, and that they should protect themselves by strong shells of their own as quickly as possi- "ble, it will be seen that the danger of exterminating a valuable bed by over-dredging would be "much less if the empty shells were replaced upon the beds."

If this advice had been followed at the time it was given, our oyster beds would now be much more valuable, but no attention was paid to it, although the attention of our people has been recently attracted to the subject by the fact that within the last two years the Connecticut farmers have visited our packing houses and have taken away ship loads of shells, which have, in many cases, been purchased at two or three cents a bushel, to be used in shelling the oyster farms of Long Island Sound.

Your Commissioners received this fall a number of oyster shells covered with young oysters, and accompanied by a sworn statement by Mr. Church, of Crisfield, Maryland, that he sold these shells in June, from the heap which had accumulated at his packing house at Crisfield during the winter, to an oyster farmer, who took them to Long Island Sound and scattered them upon his private farm. Mr. Church says in his letter that he visited this farm about five weeks after the shells were shipped, and that, taking some of them up at random, he found them covered with young oysters, and he states under oath that the shells which he sent us, some of which are copied in Figure 1, of Plate I, are some of those which he sold.

The Commissioners of Shell Fisheries of the State of Rhode Island, in their annual report for the year 1882, make the following statement upon this subject:

"The oyster shells, which have for years back been considered almost worthless, have, within a "short time, become valuable to the oyster fisheries. It is a well-known fact that large quantities of "shells are purchased here from the oyster business, and these shells, which have, until a short time, "been considered worthless, are now selling for from eight to ten cents per bushel, to be carried out of "the State, (mostly to New Haven,) for the purpose of planting them in deep water in Long Island "Sound, to catch the oyster spawn and for the raising of oyster seed. These shells are taken up at "the expiration of two years, and, with the increase of oysters adhering to them, are brought back to "the same parties selling the shells in the first instance, for the purpose of planting in our waters, "and the price paid for them is from forty to fifty cents per bushel."

Although your commissioners cannot forget that the statement by one of our members five years ago, that this is a matter of great importance, has been passed over in absolute silence, and has attracted no attention, we feel that the matter is worthy of one more effort, the more especially as the enterprise of *practical* Connecticut oysterman may have taught our people a lesson which they would not learn from a *scientific* student. We therefore recommend that such laws be passed as are necessary to compel the return of the shells to the beds. The simplest way to do this is to adopt the Connecticut plan of private farming, and we may be sure that just so soon as the fruits of private enterprise are secured to the cultivators, private interest will lead to the return of the shells to the water, as it has already done in Connecticut. In the meantime we believe that something may be accomplished indirectly by the State. Oyster shells accumulate at the packing houses so rapidly, that it is necessary for the packers to dispose of them in some way, and they are used in great quantities for building roads and wharves, and in the lime kilns and iron furnaces. As they are much too valuable to our people to permit their use in this way, we believe that if these practices were forbidden by law, the packers would be compelled to return them to the waters of our bay, in order to get them off their hands.

If, in addition to this, a law were passed forbidding the dumping of shells anywhere except upon designated areas, where they would be useful, we believe that our public beds could be reshelled without expense to the State, and as it is perfectly proper that the packers, who, by the demand which they have created for oysters to supply people outside our State, have caused the need for legislation, should bear the expense of replenishing the public beds, we recommend that a law be passed to forbid the use of oyster shells in lime kilns, or in the manufacture of iron, or for road making, or wharf building; and that a law be passed requiring the commander of each police boat to designate spots in his district where shells may be deposited upon the bottom, and that a law be passed directing that no shells shall be deposited in our waters from vessels at anchor, or from vessels which are not under weigh, or at any spot except those designated for the purpose by the officers of the oyster police.

Section II.—Exportation of Oysters for Planting.

One of the causes to which the destruction of our oyster beds is often attributed is the exportation of small oysters into other States. We have tried to gather information as to the extent to which this is practiced, but it is difficult to obtain exact statistics. Ingersoll gives a statement of the number of Southern oysters which were taken North for planting from the Chesapeake Bay in 1880, but there is no way to tell how many of them were large, marketable oysters which were planted in Northern waters for a short time while awaiting a market, and how many were small "seed" oysters which were placed upon the planting ground to grow to maturity; neither is it possible to decide with much accuracy what part of the whole number were taken from our own waters and how many from Virginia.

Ingersoll states in his "Report on the Oyster Industry of the United States" that—

6,000	bushels	of	Chesapeake	oysters	were planted annually	at Wellfleet, Mass.
475,500	"	"	"	"	"	at Boston, Mass.
40,000	"	"	"	"	"	at Salem, Mass.
3,000	"	"	"	"	"	at Newburyport, Mass.
5,000	"	"	"	"	"	at Portsmouth, N. H.
2,000	"	"	"	"	"	in other cities of New Hampshire.
75,000	"	"	"	"	"	at Portland, Maine.
7,000	"	"	"	"	"	in Buzzard's Bay and Vineyard Sound.
500,000	"	"	"	"	"	in Narragansett Bay.
65,000	"	"	"	"	"	in Eastern Conn.
450,000	"	"	"	"	"	at New Haven Conn.
175,000	"	"	"	"	"	in New York Bay.
650,000	"	"	"	"	"	on West Shore of Delaware Bay.
940,000	"	"	"	"	"	in Delaware.
Total..3,375,500						

This practice has existed for many years, and Cheaspeake Bay oysters were taken to New York and to New Jersey for planting as long ago as 1825. In many places many more Southern oysters were planted in former years than at present. Gould states that 40,000 bushels were used at Wellfleet, Mass., in 1840, and 100,000 in 1850. It is probable that for the twenty years immediately preceding the war the town of Wellfleet planted on an average 50,000 bushels of Chesapeake Bay oysters each year, or a million bushels in the 20 years, but during the war the business declined, and it is no longer centralized in this town, which in 1880 planted only 6,000 bushels.

The exportation of seed oysters from the Chesapeake Bay for planting in Connecticut was carried on upon a very extensive scale for more than fifty years, although it has practically ceased within the last ten years, and the Connecticut farmers are now able to supply all the seed which is needed in the State.

Ingersoll gives the following interesting account of the growth of this industry:

"It came about, that among the first places in New England to import oysters from New Jersey, and then from Virginia, to be transplanted for additional growth, was Fair Haven; and it is probable that far more oysters were brought there from the Chesapeake twenty years, or even ten years ago, than now are. At that time a large fleet of Connecticut vessels was employed in this traffic every winter, and some stirring traditions remain of perilous voyages during the icy season. They were better oysters that came in those days, also, than now. While a large majority of these cargoes were at once sent into the current of winter-trade, and distributed to customers all over the State (for no other harbor fattened "Chesapeakes" to any extent), a quarter or so of the whole season's importation was regularly bedded down, in April and May, to supply the summer and fall demand. The favorite bedding ground then, as now, was "The Beach," a sand spit running off into the harbor for more than a mile from the Orange (western) shore. This is bare to a great extent at low tide, but covered everywhere at high tide, and is the best possible place for its purpose. The ground on this beach rents at from two to five cents a bushel, according to location. Those occupying the Beach each year—in 1879 there were 23 in number—form themselves into a mutual protective association, and provide watchmen who never leave the ground. Formerly these watchmen lived in boats housed in, but now, upon opposite extremities of the Beach, piles have been driven and two houses have been built, where these men live, and whence they walk or row about day and night to guard the property. They go on duty at the time of the first planting, and remain until the last oyster is gathered, a period usually about nine months long. Their wages are only $40 a month, and it would seem to be an extremely tedious duty; yet there is no lack of volunteers for the places. But I have shot ahead of my subject, in following out this matter to its present status; let me return to a past period.

"The Virginia trade began about forty or fifty years ago, Captain Merritt Farran having been the first man to bring them. His cargo was a sloop load of about 600 bushels, profitably sold. The trade rapidly grew into immense proportions. Just when it was at its zenith it is hard to say—probably about thirty years ago—and it was then very profitable. The Fair Haven establishments had branch-houses in all the inland cities, as far as Chicago and St. Louis, and it was reported that the profits of a single house, from 1852 to 1856, amounted to $25,000 a year. Levi Rowe & Co., in 1856, are said to have employed 20 vessels and 100 openers, and to have sold 150,000 gallons of oysters, while companion-houses shipped from 1,000 to 1,500 bushels per day throughout the season. In 1857–'58, according to De Broca, from 200 to 250 schooners were employed in supplying the establishments in Connecticut from the Chesapeake and Fair Haven, which alone, he says, made use of 2,000,000 bushels, but this undoubtedly was a large exaggeration; one-half of that would certainly more than cover the facts. Half a dozen years later, when De Broca wrote, the decline was very perceptible."

"De Broca's description of New Haven in 1862.—Some extracts from Lieutenant De Broca's report, made in 1862, to the French government, upon the oyster industries of the United States, and reprinted in the first report of the United States Fish Commission, will present interesting, if not wholly trustworthy, reminiscences of New Haven at that time, where Lieut. De Broca is well remembered. This writer says:

"New Haven, the capital of Connecticut, ranks next to Boston in importance in the oyster trade. The business is divided into two distinct branches, the culture of oysters and the various occupations connected with their transportation to the towns of the interior.

"The principal plantations are situated in the bay. Commencing at a short distance from the head of the great pier, they extend over a distance of about three miles, almost without interruption; on the one hand to the southern part of the sandy point, and on the other to Morris creek, always leaving free the channels of navigation leading to the harbor.

"The maritime ground on which they are established is partially exposed at low tide. In some cases, however, the plantations are constantly submerged, and are at a depth varying from 1 to 6 feet, when the water is lowest. The soil is formed of sand and mud, mingled with seaweed, and the stratum of mud, upon which the oysters rest, is about three inches thick.

"The spectacle presented on entering the harbor is most curious. As far as the eye can see, the bay is covered with myriads of branches, waving in the wind, or swayed by the force of the currents. It looks as if a forest were submerged, the tops of the trees only rising above the surface of the water.

"At certain distances on the plantations, large boats are anchored or moored to posts, having a small house built upon them for the accommodation of the men appointed to watch the grounds. They are four in number. The wages of these guardians of the property amount to about $30 per month, and are paid by the association of planters. This system of surveillance is indispensable, since most of the plantations are at a distance from the harbor, and might be invaded with impunity, especially at night.

"About five hundred men are employed in planting oysters in the spring, and in gathering them in the proper season to supply the necessities of commerce.

"The New Haven banks have a very high reputation, and the number of bushels planted annually is estimated at 250,000.

"The Chesapeake oysters brought into this locality in 1879 amounted to about 450,000 bushels. Those from the Rappahannock are the favorites for winter use, and are imported almost exclusively, for planting purposes; however, Rappahannock oysters are undesirable, and those from Fishing Bay, St. Mary's and Crisfield, are preferred. But this may be wholly changed in a year or two.

"Freights vary with the vessel and the season, from 10 to 18 cents. It is estimated that 3 cents will plaint the oysters, which makes their cost from 22 to 28 cents a bushel. The selling price will average at least 75 cents, and probably more."

Within the last three years the growth of the oyster farming industry in Connecticut has caused a very great reduction in the demand for Southern oysters, as the farms of this State are now able to supply the local planters, as well as those of Rhode Island and Massachusetts. The Connecticut farms have this year furnished "seed" oysters for exportation to Europe and the Pacific Coast, and quantities have been sold in New York, also. It is not probable that the total exportation of oysters for planting from the waters of Maryland will this year exceed a million bushels, and the demand from New York and Rhode Island will probably continue to diminish from year to year, as the supply from the Connecticut farms increases, but even a million bushels is a tenth of our total crop, and there can be no doubt that the demand which has overtaxed our beds and led to their destruction, has been materially increased by the exportation of oysters for planting, and the question whether this practice should not be discouraged is therefore a proper one for discussion.

At present the chief demand for seed oysters comes from Delaware, and I accordingly quote in full Ingersoll's statement of the magnitude of the supply used by the planters of this State:

"Planting Southern Oysters in Delaware Bay.—There remains now to be considered the great business of transplanting and maturing Southern oysters in the waters off this shore. Though this stock is chiefly owned in Philadelphia and operated by Pennsylvania, yet its consideration belongs properly here, since the beds are wholly in Delaware's waters.

"The statistics I give in respect to this, was furnished me chiefly by Mr. J. C. Cleaver, collector of the Chesapeake and Delaware Canal Company at Chesapeake City, Maryland, and refer to the last half of 1879 and the first month of 1880, completing an 'oyster season.'

"All the Southern oysters which are brought to Delaware bay or to Philadelphia, both for planting and for immediate consumption, come through this canal, which leads from the Chesapeake.

EXPLANATION OF PLATE II.

FIGURE 1.—A group of oysters attached to a piece of wood; from Coste's Report on the Oyster and Mussel Industries of France and Italy. A, oysters from twelve to fourteen months old; B, oysters from five to six months old; C, oysters from three to six months old; D, oysters from one to two months old; E, oysters from fifteen to twenty days old.

In our own waters oysters grow much more rapidly, and in the warm sounds of North Carolina an oyster may reach the size of those shown at A in less than three months.

FIGURE 2.—A Cardium shell covered with young oysters; natural size; from Coste's Report.

(We are indebted to Spencer F. Baird, Superintendent U. S. Fish Commission, for the use of these figures.)

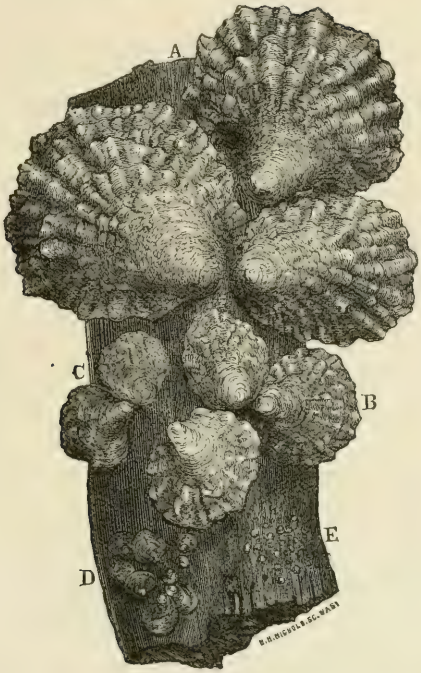


FIGURE 1.

FIGURE 2.

There may possibly be half a dozen outside trips made (all from Chincoteague island,) in the course of the year, but this is a small exception.

"The vessels, as a rule, engaged in this traffic are 'wood-droggers,' schooners of light draught and able to carry from 500 to 1,500 bushels. During the planting season they will average about 1,300 bushels per load, but when running direct to market, in winter, carry only 900 bushels, the difference arising largely from an absence of any deck-load in the latter case. The number of schooners thus used varies from year to year; but the number of trips during the season reported upon by Mr. Cleaver, was 868. At $100 a trip, charter-pay, these schooners earned that year, therefore, $86,800. Sometimes an even $100 is given to make the trip, and sometimes a rate of about $10 a day is paid, but it amounts substantially to the same thing. In addition, the charterer pays the canal expenses, consisting of entrance toll, towage, and dues of 85 cents a ton on cargo, amounting in all to about $50. The canal thus receives an annual revenue from this source of about $4,340.

"The schooners range in value from $1,000 to $6,000. The owners pay the captain of such a schooner, who must know all the little creeks and oyster-buying nooks along the whole Chesapeake coast, and be a capable man at a bargain for his employers, about $50 a month. The men in the crews get $25. The provisions supplied by the owners are said to be abundant and of good quality.

"Among this fleet are about twenty-five "role captains," who own their vessels entirely, hire their own crew, get cargoes from the South with their own money, and plant on beds claimed and prepared by themselves. Attending to their plantations personally, they bring their cargoes to the market in the fall in their own schooners or sloops, and leave them to be sold there on commission. They were thus both planters and carriers.

"During the fall and winter months, most, if not all, of the vessels go directly to the Philadelphia market, and their cargoes enter into the immediate consumption of the city. Sales are made from the hull of the schooner, without unloading into a warehouse. The number of trips made for this direct market consumption, makes only about one-fourth of the total recorded as passing through the canal. Three-fourths of the oysters brought out of the Chesapeake are intended to be planted, and find their destination in the beds along the western shore of the bay. The large dimensions of these receipts appear in the succeeding table from the Canal Company's books:

"Record of Oysters in Shell which Passed Through the Chesapeake Canal in 1879–'80."

During Months—	From Virginia waters.	From Maryland waters.	Total.	Number of oyster vessels.
1879.				
May	31,680	126,720	158,400	176
June	7,740	30,960	38,700	43
July				None.
August				None.
September	1,080	4,320	5,400	6
October	3,780	15,120	18,900	21
November	10,260	41,040	51,300	57
December	10,800	43,200	54,000	60
1880.				
January	8,280	33,120	41,400	46
February	11,340	45,360	56,700	63
March	36,400	145,600	182,000	140
April	166,400	166,400	332,800	256
	287,760	651 840	939,600	868

From—	For planting.	For Philadelphia and other markets.
Maryland waters	488,880	162,960
Virginia waters	215,820	71,940

"The planting of this 700,000 and more bushels of Chesapeake seed is not attended with any features greatly different from the same industry and investment at Fairhaven or Staten Island. When a load of oysters for planting arrives from the South, the owner of the cargo sends on board the vessel all the men he has, and the schooner then sails back and forth, around and over the designated ground. The effort in loading is to have as much as possible of the cargo on deck. It is an easy matter, then, as the vessel proceeds, to shovel overboard; and as she is constantly changing her position, and the men shovel uninterruptedly until the whole load is overboard, the oysters are pretty evenly distributed. An ordinary crew of five will thus unload 400 bushels in an hour for five or six hours in succession. Adding this expense to his first cost and charges, a planter, who puts down large quantities, expects the cost of his various lots of oysters, big and little together, will average about 25 cents a bushel.

"These Chesapeake oysters, it is scarcely necessary to say, are left down until the succeeding fall before being taken up for market. They have then grown into larger and fuller proportions, and have assumed a far better flavor than they originally possessed. Sometimes accident or circumstances will cause a bed, or a portion of it, to be saved through the winter, and not harvested until the second fall; but this is rare, very risky and not attended by a large increase of profits. Making a recapitulation of the Western Shore, produce I derive the succeeding particulars:

"*Statistical Recapitulation for Western Shore of Delaware Bay for 1879:*"

"Extent of natural "oyster rock":	acres..	500
"Extent of cultivated ground, about	acres..	3,000
"Number of planters, not counted elsewhere		40
"Number of men employed, about		625
"Earnings and board		$117,000
"Number of men partially employed		400
"Earnings of same		$30,000
"Number of trips made after Southern seed, about		620
"Freight earned by same		$62,000
"Canal charges on same		$31,000
"Southern seed planted	bushels..	704,700
"Cost of same, about		$176,175
"Northern seed planted	bushels..	370,000
"Cost of same, about		$150,000
"Southern oysters sold annually	bushels..	650,000
"Value of same		$500,000
"Northern oysters sold annually	bushels..	300,000
"Value of same		$325,000

Through the kindness of Mr. T. J. Cleaver, the collector of the Chesapeake and Delaware Canal Company, I am able to add to the table which I have quoted above from Ingersoll's report the following letter and table regarding the number of bushels of oysters shipped through the canal in each month of 1881, 1882 and 1883:

"CHESAPEAKE CITY, MD., December 14th, 1883.

"W. K. BROOKS, ESQ.:

"DEAR SIR—*Herewith please find the number of bushels of oysters having passed through the Chesa-*
"peake and Delaware Canal from January 1st, 1881 to December 15th, 1883.

"In clearing oyster boats at my office we always make our entries as coming from Chesapeake Bay, as it
"is a matter of no importance to us whether they come from Maryland or Virginia waters. Indeed, it would
"be almost impossible to get this information from the captains if we desired it. They are a very suspicious
"set of men, and if we were to ask this question of them they would think we were trying to get them in a
"trap, and therefore give evasive or incorrect answers.

"Perhaps it would not be much out of the way, however, to say one-half from Maryland and one-half
"from Virginia.

"Very respectfully,

"T. J. CLEAVER,
"Collector Chesapeake and Delaware Canal Co."

Number of Bushels of Oysters Having Passed Through the Chesapeake and Delaware Canal from Chesapeake Bay from January 1st, 1881, to December 15th, 1883.

1881		1882		1883	
Month.	Bushels.	Month.	Bushels.	Month.	Bushels.
January	None.	January	10,500	January	5,650
February	4,450	February	30,550	February	16,712
March	46,875	March	199,250	March	42,500
April	142,575	April	291,500	April	261,770
May	240,575	May	95,100	May	210,200
June	12,500	June	None.	June	3,620
July	None.	July	None.	July	None.
August	None.	August	None.	August	None.
September	400	September	None.	September	None.
October	7,460	October	4,500	October	1,900
November	12,400	November	11,050	November	6,550
December	12,150	December	7,600	December	3,325
	485,385		650,100		552,227

In discussing this subject we must bear in mind the fact that northern fishermen or boats are not allowed to catch oysters in our waters, and that the industry contributes to our State Treasury, and gives employment to our people; for all the oysters which are exported for planting must be purchased from our licensed fishermen.

Any person who lawfully owns oysters, clearly has the right to dispose of them in the best market, and nothing can be done directly to prevent our oystermen from selling to northern planters when it is to their interest to do so.

So far as the exported oysters are mature and marketable for food, it is obviously to our interest to encourage the business, which is perfectly legitimate.

The only ground upon which the practice can be objected to is that it leads to the sale by our people of oysters which would be much more valuable to them if they could be kept in our own waters until they reached maturity.

If the beds were sufficiently prolific to supply this demand for northern seed without injury, the exportation of seed should be encouraged, but our beds are overtaxed far beyond their productive power, and the practice should therefore be discouraged, for the present at least.

In another part of our report we show that oysters which cost the Delaware planters twenty-five cents per bushel, are resold in a few months for eighty cents per bushel, and many of them are bought by Maryland packers. The policy of allowing our impoverished beds to enrich the citizens of another State is an unwise one, but it is proper to point out the fact that there is no reason why our own people should not themselves have this profit of 55 cents a bushel.

It must be obvious to every one that the true remedy is to encourage planting in our own waters. We have vastly more land suitable for the purpose than the State of Delaware, and as our own planters are on the ground they would have no canal fees or transportation to pay, and they could, if they choose, secure all these oysters for their own use, and gain the profit which now goes elsewhere. The development of the Maryland planting industry is, therefore, the true remedy for the evil. But as this cannot be effected immediately, and as our beds are not now in a condition to furnish seed for other States, your commissioners believe that the exportation of seed should be checked by legislation for at least two years. Our legislature has no power to restrict commerce between States, and we therefore call attention to the fact that the table given above shows that most of the oysters for planting are exported in April, May and June, and that the closure of our beds during these months would restrict

exportation, and would for a year or two do no harm to the interests of our own people. We therefore recommend that for two years our beds be closed on April 1st.

Small oysters, suitable for planting, are more abundant in the fall than they are in the spring, and our own planters can at that time procure their seed, although we believe that as soon as a planting industry grows up in our State the public beds should be opened in the spring and summer.

Section III.—A Discussion of the Proposition to Prohibit Dredging and an Examination of the Best Method of Protecting and Regulating the Tonging and Planting Industries.

The favorite remedy for the difficulty, at least among those fishermen who are not dredgers, is the prohibition of dredging. Every one knows that our beds are deteriorating because they are excessively fished, and every one knows, too, that most of this fishing has been done by dredgers. It is therefore natural to conclude that since the dredgers have done the damage the prohibition of dredging will cure the mischief, but this is by no means true. The great demand for oysters, which has come from the growth of the packing industry, has been supplied by dredgers, because the dredge is more effective and economical than the oyster tongs, but if dredges had not been invented the demand would still have been supplied by the much more expensive and laborious method of tonging, and the prohibition of dredging now would simply cause an increase in the number of tongmen. The beds in deep water would escape, but they would then be, like many of the deep water beds of Virginia, of no use to any one except pirates, and all the beds which could be reached by tongs would be as badly off as ever.

In order to show that this is the case, and that where no dredges are used the excessive working of the beds with tongs soon causes their destruction, we will here note a number of cases where beds have been exterminated with tongs alone.

In 1874 the officers of the United States Coast Survey found a number of fine beds of valuable oysters near Portsmouth, New Hampshire. Many fine beds were found in this region by the earlier settlers, but they were destroyed so long ago that none of the natives had any knowledge of oyster-fishing or any instruments for taking the oysters; but it happened that an old oysterman from the Chesapeake Bay was living near by, and he sent to Providence for oyster tongs and began tonging upon the newly discovered beds. His example was imitated so effectively that in five years the beds were exhausted and ceased to be productive.

In the early days of the colony of Rhode Island, oysters were found there in great abundance.

No dredging has been allowed in this State for more than one hundred years, or since October, 1776, at which date the taking of oysters by drags or otherwise than by tongs was forbidden under a penalty of ten pounds for each offence, but the Rhode Island beds are now almost completely exhausted. They yield no marketable oysters, and the only place where seed oysters for planting can be procured in any considerable quantity is a space of about five miles above the Seekonk River, and the preservation of this bed is due to the fact that the oysters are bright green and are not marketable. Rhode Island has a great and profitable planting industry, but the seed oysters which are used for planting are purchased outside the State.

As no dredging has been permitted upon these beds for so long a time the dearth of oysters in waters where they formerly abounded is certainly due to persistent raking and tonging.

Ingersoll tells us that from the earliest times the borders of the Quinepiac River, near New Haven, Connecticut, have been the scene of oyster operations. The earliest settlers found on its shores great mounds of oyster shells, which showed that the Indians had resorted to its beds, season after season, for an unknown period. The first white fisherman found natural beds scattered over the bottom of the whole river, as well as in favorable areas along the eastern shore of the harbor. All of the beds were easy of access, and the result was that the raking of oysters was soon adopted as a

business by many persons who lived near the water, and a considerable retail peddling trade was thus kept up throughout the neighborhood, in addition to the home supply. Wagon loads of opened oysters traveled in winter to the interior towns, even as far as Albany, and thence westward by canal.

These beds continued to supply fine oysters for all the inhabitants of the surrounding country for many years, but they have long been worthless as a supply of food, although they still yield small oysters, which are used as "seed" for planting. The beds were exhausted by tongs, and it is interesting to note that nearly all of the oysters were removed in a single day in each year. After the beds were closed by law until November 1st, great crowds assembled on the banks of the river, on the last night of October, and at the striking of midnight by the town clock, began an attack which cleaned the beds of most of their marketable oysters before the end of the day, and a few hours of this fishing resulted in the capture of all marketable oysters.

Upon the coast of New England, north of Cape Cod, and upon the coast of New Brunswick, oysters of gigantic size and fine flavor were formerly abundant, but they have been so completely exterminated by tongs, that a well-known Boston naturalist, Dr. Gould, doubted whether there ever had been any native oysters in this region, notwithstanding the fact that all the early writers spoke of their abundance. Many of these beds were destroyed by the Indians, and others by the early settlers, while a few have survived down to quite recent times, like those near Portsmouth, of which we have just spoken.

Ingersoll states that in the early days of our history, it was not uncommon for a man to rake up a sleigh load of oysters through the ice in a single afternoon at Shediac, New Brunswick. Twenty-five or thirty years ago these beds yielded 1,000 barrels a year, and now two persons gain a scanty living upon them, and obtain between them about 200 bushels a year.

Ingersoll gives the following instructive account of the extermination within the last few years, of another valuable and prolific bed upon the New Brunswick coast, by rakes and tongs alone:

In 1876 a fisherman says that in two weeks over 4,000 barrels of oysters were taken away from the beds at Betlamin, in New Brunswick, by ships and schooners which bought their cargoes from the small raking boats upon the beds. At this time the oysters were distributed everywhere over the harbor so thickly that every square foot seemed to be occupied, and the beds swarmed with small boats, each operated by two men. Four years later, in 1880, the oysters were almost exterminated.

Old men still remember when rich beds were to be found in Hillsborough bay, in New Brunswick. The oysters were so abundant that they seemed inexhaustable, and a tonging boat could take eight bushels an hour. They have been almost entirely destroyed by tongs alone, and they now yield only a few bushels a year.

All along this coast, north of Cape Cod, the most prominent fact in relation to the oysters is their former abundance in comparison with their present extinction. Most of the beds were destroyed by the Indians or by the early settlers before dredges or any improved means of taking the oysters were introduced, and we know that the destruction of the few which have persisted within modern times have been destroyed by tongs and rakes alone.

At Damariscotta bay, on the coast of Maine, there have been no oysters for many years, although the great mounds of oyster shells along the shore bear witness that the Indians here found an abundant supply, and they almost destroyed the beds, although there is reason to believe that the first white settlers found that a few oysters still remained.

The early settlers of New England continually refer to the abundance of oysters at points where not a single oyster can now be found. In 1634, William Wood, in a work on New England, speaks of a great oyster bank in the Charles river, near Boston, and another in the Mystic river, each of such size as to obstruct navigation. The oysters were the long, slender "coon" oysters, which are still to be found in our own waters on undisturbed natural beds. Of their size and form he says:

"They be great ones in form of a shoe-horne; some be a foot long. These breed on certain banks that are bare every spring-tide. This fish, without shell, is so big that it must admit of a division before you can well get it into your mouth." The oyster beds in these two rivers are spoken of by many of the early writers, but they are now gone so completely that there is not even a tradition to mark the place where in 1634, according to Wood, "the oyster bankes do barre out the bigger ships."

In 1637 Thomas Morton, writing of the Plymouth Colony, says: "There are great stores of oysters in the entrances of all rivers; they are not round as those of England, but excellent, fat and all good. I have seen an oyster bank a mile at length."

Native oysters were abundant at Wellfleet, on Cape Cod, at the time of the first white settlements, and for more than a hundred years the town was famous for its oysters, but they became extinct in 1775, through excessive tonging, although the pious inhabitants attributed their destruction not to their own rapacity, but to a disease sent by Providence upon the oysters, as a punishment for the sins of the fishermen, who certainly were more worthy of such an infliction than the helpless oysters.

In all of these cases the exhaustion of the beds has been brought about almost or entirely without the use of dredges, although in a few cases dredges may have been used to a slight extent.

The list might be greatly extended were it not for the fact that upon all the more southerly beds dredges as well as tongs have been used.

Enough instances have been given to show that the prohibition of dredging will not save any bed which can be reached with tongs, and as the dredge is much more scientific, effective and economical apparatus than the rude tongs which it has superseded, there does not seem to be any reason why its use should be prohibited.

The use of the labor-saving machinery is always opposed by the advocates of the old methods, and the destruction of the dredging business would undoubtedly help the tongmen, but as it would not save the oysters or benefit the community at large, the rights of the dredgers should receive as much recognition as the rights of the tongmen.

In one way the use of dredges is a positive advantage to the beds. On a natural and unworked bed the oysters grow side by side in clusters, so crowded together that none have room for perfect growth, and they become very long and slender. These long, narrow oysters, which are known as "coon oysters," are of little commercial value, although they soon widen and become valuable after they are broken apart. On a natural bed the oysters are often overgrown with sponges, as is shown in Plates III and IV, which are copied from Lieut. Winslow's "Report on the James River, Va., and of Tangier and Pocomoke Sounds." The dead shells which are found on an unworked bed are usually so covered with sponge, slime and other substances that they furnish no clean surface for the attachment of spat, and as dredging tends to turn up clean shells, break up and scatter the clusters, and to tear away the sponges and other foreign bodies, it is a positive benefit to the beds.

The following statement by a Virginia official contains a correct account of some of the benefits of dredging:

"In a report upon the 'Oyster Beds of the Chesapeake Bay,' made in 1872 by Mr. O. A. Brown to the auditor of public accounts of Virginia, it is said that 'the dredging of oysters is as necessary to their development and propagation as plowing is to the growth of corn; the teeth of the dredge take hold of the rank growth of the oyster beds, and, by being dragged through them, loosen them (which is done by hand in France in the management of their oyster parks), and give them room to grow and mature properly; moreover, beds are continually increased in size, for when the vessel runs off the rock with the chain-bags filled with oysters, the oysters are dragged off on ground where no oysters existed, and thus the beds are extended, and when the vessel is wearing or tacking to get back on the oyster beds the catch just taken is being culled off, and the cullings thrown overboard to form new cultch for drifting spat to adhere to. Reliable oystermen tell me that since dredging has been carried on in Tangier and Pocomoke the beds have more than doubled in size, and with the moderate force that worked upon them prior to the war were

continually improving. During the war the waters were thrown open to every one who would pay the military officials for a permit to oyster; the consequence was that the oyster beds were scraped bare, and it was two years before they could recuperate."

Many persons who do not advocate the total prohibition of dredging believe that the size of the dredging boats and the size and weight of the dredge should be restricted by law. They give two reasons why the size of the boat should be restricted, urging that the large boats are able to work upon the beds when the police boats cannot venture out, and that their size permits them to use very large dredges, and thus catch great quantities of oysters.

The police boats are unfit for service in rough weather, but that does not seem to be a sufficient reason for rendering the dredging boats unseaworthy also, but rather for constructing better police boats.

It is asserted that the use of large dredges causes much evil, as they ruin the beds by crushing or smothering, or by burying in the mud more oysters than they capture; but the private farmers of Connecticut find it to their advantange to use much heavier dredges, and their farms improve under this treatment, although very heavy dredges are hauled by steam over the beds, even in the spawning season.

After carefully considering the subject your commissioners believe that the prohibition of dredging would not be any help to the beds, and that the interest of our whole people demands that our oysters shall be taken as cheaply and effectively as possible, and that the use of labor-saving appliances and improved modern methods shall be encouraged. They therefore approve the removal of all artificial restrictions upon the manner of taking oysters.

We recommend that dredging be prohibited upon the public beds in the Potomac River and in Pocomoke Sound, but this recommendation is made as a political necessity, as the State of Maryland has no power to prevent illegal dredging in these waters, while she has the power to prohibit all dredging.

We do not believe that this measure is desirable in itself, but it is the only measure which it is in our power to adopt.

If the prosperity of the natural beds were the only thing to be considered, we should, for the reasons which we have just given, favor the opening of all our oyster area to the dredgers; but the welfare of the beds is not the only thing. The rights of the tongmen and those of the planters also demand consideration. At present it is well known that there is inadequate protection for our planted oysters, and that the law which prohibits dredging in most of our rivers and inlets is of no effect. Almost every day the newspapers contain accounts of the piratical incursions of the dredgers upon these reserved grounds, and the evil increases from year to year as the large beds in the deep waters become depleted. The chief duty of the nine sail-boats of the State fishery force, as at present constituted, is to guard the tonging and planting grounds from the depredations of dredgers, and the lack of efficient protection is usually attributed to their neglect of duty; but the well-known fact that Virginia, which maintains no oyster police, suffers very much more than Maryland, shows that our navy does afford some protection, and no one who is familiar with the subject can wonder that the service is not more efficiently done.

The boundaries of the area open to dredgers have not been established from any broad and general point of view, and the lines beyond which dredging is prohibited are not lines which can be guarded. The desirability of facilitating the enforcement of the laws does not appear to have entered into the minds of the persons who have established the boundaries. In most cases the law says that there shall be no dredging within a specified distance—usually half a mile or a mile of a certain point—and the boundary is of course a circle around the point named. The precise location of the point is not stated in the law, and there is in many cases an opportunity for a range of a mile in difference of opinion as to the exact point designated. There is no provision for marking out this circle by buoys or otherwise, and it is in most cases quite impossible for the officers of the fishery force, or the judges who may be called upon to try persons accused of violating the law, or even the dredgers themselves, to say, with any exactness, when dredging first ceases to be legal. The complexity and indefiniteness of the boundary line is in itself a strong temptation to the dredgers to trespass beyond it, and while the organization of the oyster

navy is a pressing necessity, the establishment of a well-defined boundary is a matter of even greater importance. We have shown again and again in this report that private cultivation of oysters is the true solution of most of our difficulties, but no one cares to engage extensively in the planting of oysters which may at any time be stolen by dredgers, and no great growth of the planting industry can be hoped for until the boundary of the bottoms reserved for tonging and planting, and closed to the dredgers, is simplified.

We accordingly propose that in place of the system of intersecting circles now recognized by law, a line as nearly straight as possible, be established, to run from headland to headland, entirely around the bay to separate the lands where dredging is permitted from those where it is prohibited. In the charts which accompany this report, all the bottoms of the shore side of this line, which is minutely described further on, are colored blue, while the areas where dredging is permitted are colored yellow. We also recommend that buoys and other suitable landmarks be placed at such points upon this line as the Oyster Commissioners shall deem it necessary to mark in this way.

In laying down this line we have kept most prominently before us the necessity for boundaries which can be protected, and we have therefore found it necessary to open to dredgers certain beds which have been legally closed, although we believe that some of these beds have actually been open to dredgers.

On the other hand, we have closed certain beds which have hitherto been open, and while the boundary, which we propose, will undoubtedly be injurious to the interests of the tongmen of certain districts, the total area where dredging is prohibited is much increased.

We also recommend a plan for the reorganization of the Fishery Force, the adoption of which will, as we believe, render the rigorous enforcement of the laws possible.

We also recommend certain changes in the law relating to tongmen. At present the tonging license only permits the taking of oysters within the county where the license is granted, but as the public oyster beds are the property of the whole State, and not of any particular county, we recommend that such a change be made that any holder of a tonging license may take oysters in any waters which are open to the public.

As the State bears the expense of protecting the rights of the tongmen, we recommend that all money received for tonging licenses shall be paid into the State Treasury to the credit of the oyster fund.

Section IV.—On the Closed Season.

Among the favorite remedies for the destruction of the oyster beds the shortening of the season is a favorite measure, and it has many advocates. This remedy seems, at first sight, to be an effective one, but a little thought shows that it is, in reality, of no very great value.

So long as our present oyster policy is maintained it will be necessary to have a closed season to facilitate the enforcement of other legal measures, but as it is clear to every one that a great number of fishermen working upon a bed for a short season will do just as much damage as a lesser number working for a longer time, we cannot hope that laws to shorten the season will, in themselves, effect any great improvement in the condition of the beds.

Ingersoll gives a very vivid description of the method of fishing in early days, upon one of the natural beds of Connecticut, and as this bed was finally exterminated by little more than one day's fishing in each year, we quote his account in order to show how little protection can be offered by a closed season.

Ingersoll says: "The law was 'off' on the 1st day of November, and all the natural beds of the "State became open to any person who wished to rake them. In anticipation of the date, great prepara- "tions were made in the towns along the shore and even for twenty miles back from the sea side. Boats "and rakes, and baskets and bags were put in order. The day before, large numbers of wagons came "toward the shore from the back country, bringing hundreds of men with their utensils. Among these "were not unfrequently seen boats, borne in the rigging of a hay cart, ready to be launched on the ex-

CLUSTER OF OYSTERS, SPONGES AND BARNACLES

Fastened to a Small Stone.

Natural Size.

From Winslow's Report on the Oyster Beds of Tangier and Pocomoke Sounds.

CLUSTER OF OYSTERS AND SPONGE.
From unworked beds, Chesapeake Bay
Natural Size.

From Winslow's Report on the Oyster Beds of Tangier and Pocomoke Sounds.

"pected morning. It was a time of great excitement, and nowhere greater than along the Quinepiac. "On the day preceding, farmers flocked into Fair Haven from all the surrounding country and brought "with them boats and canoes, of antique pattern and ruinous aspect. These rustics always met with a "riotous welcome from the town-boys, who hated rural competition. They were very likely to find their "boats, if not carefully watched, stolen and hidden before they had a chance to launch them, or even "temporarily disabled. These things diversified the day and enlivened a community usually very peace-"ful, if not dull. As midnight approached, men dressed in oilskin and carrying oars, paddles, rakes and "tongs, collected all along the shore, where a crowd of women and children assembled to see the fun. "Every sort of craft was prepared for action, and they lined the whole margin of the river and harbor on "each side in thick array. As the 'witching hour' drew near, the men took their seats with much hilarity "and nerved their arms for a few moments vigorous work. No eye could see the face of the great church "clock on the hill, but lanterns glimmered upon a hundred watch-dials and then were set down, as only "a coveted minute remained. There was a hush in the merriment along the shore, an instant's calm, and "then the great bell struck a deep-toned peal. It was like an electric shock. Backs bent to oars and "paddles churned the water. From opposite banks, waves of boats leaped out and advanced towards one "another in the darkness, as though bent on mutual annihilation. 'The race was to the swift and every "stroke was the mightiest. Before the twelve blows upon the loud bell had ceased their reverberations, "the oyster beds had been reached, tongs were scraping the long-rested bottom, and the season's campaign "upon the Quinepiac had begun. In a few hours, the crowd upon some beds would be such that the "boats were pressing close together. They were all compelled to move along as one, for none could "resist the pressure of the multitude. The more thickly covered beds were quickly cleaned of their bi-"valves. The boats were full, the wagons were full, and many had secured what they called their 'win-"ter's stock' before the day was done, and thousands of bushels of oysters were packed away under "blankets of sea weed, in scores of cellars. The first day was the great day. By the next day the rus-"tic crowd had departed, but the oysters continued to be sought. A week of this sort of attack, how-"ever, usually sufficed to clean the bottom so thoroughly that subsequent raking was of small account."

For a few years the bed was able to resist this attack and recover from it, but it was not long before all the mature and full grown oysters were caught, and at the present time the bed does not yield marketable oysters, although it still provides seed oysters for planting.

It is clear from the history of this bed, and of many others which might be referred to, that as oysters grow scarce and the demand for them increases, the only effect of a closed season is to assemble all the oystermen upon the bed at the end of the season. The oysters which would otherwise have been removed slowly are then taken away rapidly, and the plan has no advantages as a means of protection unless the closed season is long enough to allow a new generation of young oysters to grow up and replenish the beds.

Although the closure of the beds for a part of each year is of very little value in itself, a closed season is a great help in the enforcement of other means of protection, and many of the States which own oyster beds have passed laws to prevent the taking of oysters in certain months.

In Massachusetts any resident may take oysters for family use between September 1st and June 1st, but no one can take them without a permit between June 1st and September 1st, although the local authorities have the power to grant permits to fish for oysters at any time.

Some of the public beds of Rhode Island are open to residents between September 15th and May 15th, while others are open *only between* April 1st and June 15th, but no one can take more than twenty bushels in one day.

Connecticut has no closed season, and her public as well as private beds are fished at all times. The beds in the river Thames, however, are closed by a local law between March 1st and September 1st.

New York has local laws for the closure of the beds of certain regions at specified times, and some of the towns have town laws to the same effect, thus the beds of Great South Bay are closed by a State law from March 1st to September 1st, and those in Harlem river from June 1st to August 30th, while

the town of Brookham has a town law closing the beds, which furnish the well-known "Blue Point" oysters, from June 15th to October 1st.

In certain counties of New Jersey, the closed season is from May 1st to September 1st; in others from July 1st to September 1st, and in still others from May 1st to October 1st.

The public beds of Delaware are closed from April 30th to September 1st.

In Virginia the closed season is from May 1st to September 1st, but any resident may catch two bushels a day for family use, and any owner of planted oysters may catch them at any time and in any quantity for family use.

In Ireland the season opens on September first in some localities, on October first in others, and on November first in others, and it closes on March first, April first or May first. It is unlawful to possess any oysters during the closed term. The inspectors of fisheries can call a meeting of interested persons to decide upon a change in the closed season.

In the English channel the closed season, as established by the concurrent legislation of England and France, is June sixteenth to August thirty-first, and any boat found at this time with a dredge aboard is held guilty of a violation of the law.

In Maryland no dredging is allowed between April 1st and October 15th, and no oysters in the shell can be carried outside the State between April 1st and September 1st. There is also a State law in the following words: It shall be unlawful for any person or persons to take or catch oysters, except for private use, to the amount of five bushels per day, or for sale of the same to any citizen or citizens of the neighborhood, and to them only for the purpose of being consumed when sold, or for the purpose of replanting or bedding in the waters of the counties wherein they are caught, or for sale to the citizens of the county wherein they are caught, and to them only for the purpose of replanting or bedding in the waters of said counties, between the 15th day of April and the 1st day of September."

It will be seen that a special act of Legislature is needed to explain and define what the ambiguous wording of this section is intended to prohibit or permit; but Sec. 13, of the act of 1874, for which the words above quoted were substituted in 1880, forbids the taking of oysters during the closed season, except for private use, or for the purpose of replanting, or for sale to the citizens of the county next adjoining. It is, therefore, probable that the framers of the present law wished to permit by it, the taking between April 15th and September 1st of oysters to be sold to residents of the neighborhood for food, or to citizens of the county for planting, and also to permit the taking of five bushels a day for private use.

It will be seen by examination that almost the only thing which these laws have in common is the prohibition of oyster fishing in the summer months, and to this there are exceptions, as some of the Rhode Island beds are open only in the summer, while those of Connecticut are open at all times. This provision, which is borrowed from the laws for the protection of game, is based upon the fact that this time is the spawning season. Game birds soon desert a region where they are disturbed in the breeding season, and as they lay few eggs and care for their helpless young, the destruction of an old bird at this time may result in the death of the whole brood. The provision of the game law which forbids the capture of game during the breeding season is therefore a wise one, but oysters are very different from game birds. They discharge vast number of eggs into the water, but they take no care of their young, and while it is true that the removal of too many mature oysters from a bed destroys its productiveness, the time when they are removed is a matter of no consequence, and over fishing in December is in this respect as bad as over fishing in May.

One of your commissioners has made a study of the spawning time of our oysters, and has carried his observations over several years. He has found spawning oysters in our waters in every month in the year except December, January and February, and he has had no opportunity to visit the beds during these three months.

By far the greater number of these oysters, however, are found to spawn between May 20th and July 1st, and although the temperature of our spring months causes considerable variation, this period

may properly be called the spawning season. At any time before May 20th, the disturbance of the beds can do little harm, and the experience of the Connecticut oyster farmers show that the thorough raking of the beds just before the spawning season is a positive benefit. The young oysters cannot attach themselves to dirty and slimy shells, and if all the sponges, hydroids and sea weeds could be dragged from our beds in April and May, and if the old decayed and slimy shells could be plowed under and covered with the cleaner shells from below the surface by dredging just before the spawning season, the fertility of the beds would be greatly increased, and there is, therefore, nothing in the nature of the oyster to demand the closure of the beds in April and May.

Your commissioners believe that no increase in the value of our beds can be hoped for until it is brought about by private cultivation, and that the State should use every possible means to foster and encourage the oyster planting and oyster farming industries. We show elsewhere that the States where the oyster industry is most prosperous have found it necessary and to their advantage to use the natural beds chiefly as a supply of seed for planting, and we believe that whenever the people of our State are prepared to use our great natural advantages for oyster culture it will be wise to throw open the natural beds in the summer time, but at present such a measure would simply result in the depletion of the beds, without any compensating advantage.

Soon after the young oysters are born they fasten themselves to stones, gravel, empty shells, living oysters and other clean, hard substances. They are at first so small that they are in no danger of injury by dredgers, and there is, therefore, no reason why the taking of marketable oysters should not be continued all summer if the large oysters could be taken away without the young ones, but these are at first so small that they are invisible, and for several months they are too small to be removed from the shells of larger oysters. As it is very difficult to enforce culling laws, the opening of the public beds immediately after the spawning season would cause millions of the small oysters to be carried away on the shells, and even if the culling laws could be enforced, many of the small oysters would be carried away on the large ones.

This would do no harm, and it would, in fact, be a great advantage, if the small oysters were used as seed for planting; but at present most of them are destroyed.

We therefore believe that, for the present at least, the public beds should be closed for as long a time as possible in the fall, in order to give the young oysters time to grow large enough to render it possible to detach them from the larger ones and from the shells. In another part of our report we recommend that each public bed be examined annually in order to determine how many oysters it can yield without injury. This examination should be made in August or September in order to learn how many young oysters have settled upon the bed, and as the analysis and publication of the results of this examination would require at least two months, the opening of the public beds should be postponed as long as possible.

If the welfare of the beds were the only thing to be considered, your commissioners would recommend the closure of the public beds from June 1st to December 1st for the next two years, but we believe that in determining the length of the closed season the interest of the oyster business should also be consulted.

After the closure of the packing houses in the early spring, most of the oysters which are taken are sold outside the State at a very low price to planters, who, in many cases at least, resell to Maryland packers in September and October at a great advance.

If our own people would themselves engage extensively in the planting business, or if our beds were not already overtaxed, it would be wise to encourage the taking of seed to be sold to northern planters, as this is one of the legitimate sources of the demand for our oysters.

It is obvious, however, that until something is done to increase our supply, the condition of our beds demands that the taking of oysters be in some way restricted. The supply cannot be increased immediately, and as the closure of the public beds in the spring would injure our own people less than it would

at any other time, and as it would restrict the exportation of seed oysters, which cannot now be spared, we believe that for the next two years the closed season should begin on April 1st.

As soon as our people engage extensively in oyster planting, and need these months to gather their seed oysters, and as soon as our beds are sufficiently prolific to supply northern planters, we believe that the beds should be thrown open until June 1st, or even longer.

As regards the time of opening the season, the oyster packers affirm that the early fall is the time when their business is most profitable, and that the closure of our beds at this time compels them to buy at a higher price the oysters which have been taken North from our beds and planted in other States. They therefore advocate the opening of the public beds on September 1st. We believe that the continuance of the closed season until December 1st would be a benefit, as it would allow the young oysters to grow large enough to be removed from the marketable oysters, and thrown back on to the beds, but as we feel that the claims of the oyster business deserve consideration, we recommend that the time be shortened and that the closed season be only until October 15th.

The experience of Connecticut, where both public and private beds are open throughout the whole year, and are rapidly increasing in number, show that a closed season is not necessary for the preservation of the beds, and we recommend the closing of our beds between April 1st and October 15th, chiefly to facilitate the enforcement of the oyster laws, and to give to the officers of the oyster navy time to examine the condition of the beds, to make surveys, and to perform other duties which are described in detail further on.

As the closed season is a matter of policy and is not due to the nature of the oyster, we believe that it should be made absolute, and that all laws which permit any one to take any oysters from the public beds should be repealed.

We show, in another part of our report, that it is possible to stock oyster farms and planting grounds without drawing upon the public beds, and there is no reason why those oyster planters, who wish to get their seed from the public beds, should not do so after the oyster season is opened. It is true that they would then have to compete with the prices paid by the packers, but as our present oyster policy is opposed to any private interest in the beds, there is no good reason why a planter should have oysters from the public beds any more cheaply than any one else.

The law which allows any person to catch oysters from the public beds, at any time, for family use or for sale in the neighborhood, is a wide loop-hole for infringement of the law, and so long as our present oyster policy is adhered to, we believe that the public beds should be absolutely closed during the closed season; the more especially as the changes which we recommend in the five-acre law will put it within the power of any resident to supply his own wants and those of his neighbors from his private grounds.

We therefore recommend that, for the next two years, the taking of oysters from the public beds be prohibited from April 1st to October 15th, and that all laws or parts of laws inconsistent with this recommendation be repealed.

Section V.—On the State Fishery Force.

The State Fishery Force is an important factor in the oyster problem, and most of the oystermen unite in laying much of the responsibility for the destruction of our oysters upon this convenient scapegoat.

Your commissioners believe that the resolution under which we were appointed requires us to report upon this subject, and we have accordingly given much of our time to an examination of the Fishery Force.

We find that little or no attention has been paid by the framers of our laws to facility in enforcing them, and we believe that, as these laws are at present, thorough enforcement is impossible.

We also find that the area which our navy is required to guard is much too large to admit of efficient

protection by our present fleet, and the superior seaworthiness of the fishing vessels enables them to work when our navy cannot pursue them.

We also learn that the navy is not required to be upon duty at night, or at least that the officers thus construe the law, which requires them to keep their vessels on duty "when circumstances will permit."

The organization and pay and duties of the force are of such a character that the State cannot command the service of the best men.

No navy can be efficient if the appointment and promotion of its officers depends upon anything but fitness for their duties, and the most conspicuous faults of the Fishery Force are directly due to the American method of appointing and promoting the servants of the government.

For these reasons we refrain from expressing any opinion upon the competency and diligence of the officers of our force, although one of our number, a gentleman who is qualified by long service in the United States Navy to handle the subject with skill and ability, has prepared a special report, in which he points out the proper course to be taken in the reorganization of the Fishery Force. This report is printed further on, and its recommendations are embodied in a bill which is submitted herewith.

At various points in our report we recommend that new duties, such as the surveying and mapping of our natural beds, annual examination of the condition of the beds, the placing of buoys and landmarks, and the location of private oyster grounds be required of the force.

If these recommendations are adopted it will be absolutely necessary to reorganize the force in the manner recommended in the chapter on that subject, as our boats are unfit for the work, and as the officers have not the necessary qualifications, since no such duties were required when they were appointed.

We find that among the obstacles to the enforcement of the laws two require immediate attention.

These relate, first, to the laws for the protection of the Potomac river and Pocomoke Sound; and, secondly, to the local laws to regulate fishing in Tangier Sound and its tributaries.

Section VI.—The Laws for the Protection of the Oyster Beds of the Potomac River and Pocomoke Sound.

The oyster laws of Maryland and Virginia have no features in common, as Virginia permits no dredging in her waters, and draws her revenue from a complicated system of taxation upon oysters, while Maryland authorizes dredging, and derives her revenue from fees for licenses to take oysters.

Great confusion, therefore, results in all waters which lie near the boundary, and this confusion is greatly increased by a compact between the States, known as the compact of 1785, which provides that citizens of each State shall have in common the right to fish for oysters in the Potomac river, and that neither State shall, in these waters, enforce any law which has not been approved by the other State.

The magnitude of the interests at stake, and the complexity of the subject, renders the protection of these fisheries one of the most difficult problems connected with the oyster interest, and your commissioners hesitate to discuss a theme which has already occupied the best statesmen of both States, but as neither State has approved the oyster laws of the other, the oyster beds upon our boundaries are at present absolutely without protection, and any one who is arrested anywhere in Maryland, with oysters or apparatus for taking oysters in his possession in violation of law, can escape punishment by swearing that he has been oystering in the Potomac.

Within the last two or three years an effort has been made to secure the joint action of the two States, but nothing has yet been accomplished.

In 1877 J. S. Black and Charles J. Jenkins were appointed arbitrators by the States of Maryland and Virginia to establish and fix the true boundary line between the States, and the line which they established is laid down in red on chart No. 4 of this report; the line according to the compact of 1785,

being laid down in yellow, and the original line according to the charter of Lord Baltimore, in 1632, in blue.

In 1882 the General Assembly of Maryland passed the following joint resolution, appointing a committee to confer with a similar committee to be appointed by the General Assembly of Virginia, upon concurrent legislation between the two States for the better protection of oysters in the Potomac River and Pocomoke Sound.

JOINT RESOLUTION No. 17.

WHEREAS the General Assembly of the State of Maryland, at the January session, in the year eighteen hundred and eighty, chapter thirty-six, passed an act concerning the taking and catching of oysters in the Potomac River; and chapter four hundred and forty-five of the acts passed at January session, eighteen hundred and eighty, entitled "An act to protect oysters in the waters of Pocomoke Sound, in Somerset county;" and whereas the act requires the assent of the General Assembly of the State of Virginia, under the compact between the States of Maryland and Virginia, in the year seventeen hundred and eighty-five, that the same may become effective; therefore

Resolved by the General Assembly of Maryland, That five members of this General Assembly, two on the part of the Senate and three on the part of the House, be appointed by the presiding officer of each body respectively, who shall, as soon as practical, confer with the General Assembly of Virginia, touching the matter enacted in said act of eighteen hundred and eighty, and request their assent thereto at their present session, if the said committee shall deem the said laws hereinbefore referred to, to be the best for the oyster interest in this State, and to confer with the said Legislature upon any other law which they may deem it necessary to pass for the protection of oysters in the waters already mentioned, and report the result of the conference to this General Assembly.

Resolved, second, That if the said act shall be assented to by the State of Virginia, and a similar act be passed by their General Assembly, that the Governor of each State, respectively, be requested to secure the necessary legislation by the Congress of the United States, as required by the Constitution of the United States, to make the said act valid and effective.

The acts referred to in this resolution are as follows :

"CHAPTER 36."

"AN ACT to regulate the catching of oysters in the waters of the Potomac River."

"SECTION 1. *Be it enacted by the General Assembly of Maryland*, That no boat or vessel propelled by steam shall be used in catching oysters in the waters of the Potomac River, and no other boat shall be used in catching oysters with scoop, dredge, drag or similar implement, in the waters of said river, without first having been licensed as hereinafter provided."

"SEC. 2. *And be it enacted*, That the Comptroller of the Treasury shall, upon application of any person who has been a resident-citizen of this State for twelve months next preceding such application, and who is the bona fide owner of the boat or vessel sought to be licensed, and to no other person, issue a license to use such boat or vessel in catching oysters with scoop, dredge, drag or similar implement within such of the waters of the Potomac River as are not prohibited by the provisions of this act, which license shall hold good for one year, but shall only authorize the catching of oysters between the fifteenth day of October and the first day of April; but it shall be lawful for the licensed owner of any such boat, whenever such owner shall sell and convey by bill of sale for a bona fide consideration said boat to any person who has been a resident of this State for the twelve consecutive months next preceding such sale, to transfer the said license to said vendee with said boat, which license, when so transferred, shall entitle said vendee with said boat to the same privileges for catching oysters in the waters of the Potomac River that the vendor had before such sale, provided that said vendee shall appear before the Comptroller of the Treasury and make oath before him to all the facts, matters, things and prerequisites required of said

original vendor before taking out such license, upon which said license said Comptroller shall certify the fact of said vendee having taken said oath, and for which the said vendee shall pay the sum of five dollars, to be paid to the State of Maryland."

"SEC. 3. *And be it enacted*, That the owner of such boat shall make oath before the Comptroller or his clerk that he is the bona fide owner of such boat to be described in the license; that he has been a resident citizen of the State for the time beforementioned; that there is no lien on said boat held by a non-resident, and that said boat shall not be used in violating the provisions of this act; such applicant shall exhibit to the Comptroller at the time of such application the Custom-House enrollment or license of such boat, and if such boat is under Custom-House tonnage shall swear to her tonnage."

"SEC. 4. *And be it enacted*, That before granting such license the Comptroller shall receive for it from such applicant the sum of three dollars per ton for every ton the boat may measure; said license shall be exhibited whenever called for by any officer of the State Fishery Force or any person having a right under the provisions of this act to make arrests and seizures for violating any of its provisions."

"SEC. 5. *And be it enacted*, That no person or boat licensed under the provisions of this act shall take or catch, or be used in taking or catching oysters with scoop, dredge, drag or similar implement, in any waters of the Potomac river of less than twelve feet in depth, nor in any of the waters of said river between the Maryland shore and straight lines, as follows: From the most eastern point of the headland known as Posey's Bluff to a buoy near the southern or southeastern point or prong of Herron Island bar, thence to Blackistone's Island Light-House, thence to a point near the end of Cobb's Point Bar."

"SEC. 6. *And be it enacted*, That if any person or persons having been licensed under this act to catch oysters with scoop, dredge, drag or similar implement, in the waters of the Potomac river, shall violate the provisions of the preceding sections, such person or persons shall be liable to arrest, and the boats, vessels and equipments used shall be seized, and upon proof of such violation before a justice of the peace or a judge of the circuit court for the county nearest the place of such violation, on arrest and seizure, shall be fined not less than fifty dollars nor more than three hundred dollars; and said fine and all costs of prosecution shall be a lien on boats, vessels and equipments, which, if said fine and costs of prosecution be not paid within ten days after judgment, or appeal be not taken as hereinafter provided, shall be sold at public sale to the highest bidder for cash, under such orders and notice as the judge or justice aforesaid may prescribe. If said arrest and seizure be made by any officer of the State Fishery force, said fine shall be paid into the treasury of the State; but if made by any other person or persons having the right to arrest and seize, one-half of said fine shall be paid to the clerk of the circuit court of the county in which the case has been tried, to be paid by said clerk to the Comptroller of the State, and the other half shall be equally divided between the parties who made or assisted in making the arrest and seizure."

"SEC. 7. *And be it enacted*, That any boat, vessels and equipments, owned wholly or in part by any non-resident, used in catching oysters in the waters of the Potomac river with scoop, dredge, drag or similar implement, upon seizure and proof, shall be condemned by any judge of the circuit court or justice of the peace of the county nearest the place of her capture, and shall be sold by the sheriff of the county where condemned to the highest bidder for cash, after ten days' notice of the time and place of sale. One-half of the proceeds of sale, less half the costs of prosecution and sale, shall be paid to the parties who made the capture, except when the capture was made by the State Fishery Force, and the balance shall be paid into the treasury of the State."

"SEC. 8. *And be it enacted*, That the Comptroller of the Treasury shall have painted, in black figures on white canvas, two sets of numbers corresponding to the license to catch oysters with scoop, dredge, drag or similar implement. Each figure shall be twenty-two inches long and of proportionate width, and the figures shall be at least six inches apart; and he shall give to each person taking out such license two numbers thereof, one of which shall be firmly sewed upon the starboard side and in the middle of that side of the mainsail which is above the close reef, and the other number on the port side and

in the middle part of the jib which is above the bonnet and reef. These numbers shall be placed in an upright position, and be worn at all times during the dredging season, and shall not be concealed or defaced; and no other number shall be exposed to view or be used than that which is furnished by the Comptroller. Any captain or other person in charge who shall violate the provisions of this section shall, upon proof of such violation before a judge of the circuit court or justice of the peace of the county nearest which such violation occurred, be subject to a fine of not less than fifty dollars nor more than one hundred dollars, and such fine and the costs of prosecution shall be a lien upon such boat or vessel on which were violated the provisions of this section, and unless said fine and costs be paid within ten days, or appeal be taken, such boat or vessel shall be sold at public sale to the highest bidder for cash, under such orders and notice as the judge or justice of the peace may prescribe; one-half of the fine to be paid to parties making the arrest and capture, unless the arrest and capture be made by the State Fishery Force, and the balance to the treasury of the State."

"Sec. 9. *And be it enacted*, That any person who has been a resident-citizen for the twelve months next preceding his application of a county bordering on the Potomac river, desiring to use any canoe or other boat in catching oysters for sale with rakes or tongs in any of the waters of the Potomac river, shall first obtain, by application to the clerk of the circuit court for the county wherein he resides, a license therefor, and such license shall have effect from the first day of June in the year in which it may have been issued to the first day of June next succeeding; provided that such license shall not authorize the use of said canoe or boat in taking or catching oysters in any creek, cove, inlet, bay or sound within the limits of any county other than that wherein the license shall have been issued."

"Sec. 10. *And be it enacted*, That each and every license to catch oysters, for sale, with tongs or rakes, in the waters of the Potomac river, shall state the name and residence of the person to whom the same is granted, the number and length of the canoe or boat by top or over-all measurement, the county in which the same is to be used, and the period at which said license will expire. Said license shall also state that the holder thereof is, by virtue of said license, authorized and required to make, or assist in making, arrests of any persons, and seize any boats, vessels and equipments, engaged in violating the provisions of this act. For such license the applicant shall pay to the clerk of the circuit court issuing the same as follows: For a boat or canoe measuring in length twenty feet or less the sum of two dollars; for a boat or canoe twenty to twenty-five feet in length the sum of three dollars; for a boat or canoe twenty-five to thirty feet in length the sum of four dollars; for a boat or canoe over thirty feet in length the sum of five dollars; and for sloops under Custom-House measurement the sum of six dollars. And all oysters taken shall be culled upon the natural beds where they are taken. The amount received from tonging licenses shall be paid by the clerk to the school commissioners for the public schools of the respective counties where such licenses are issued, provided that the sum received from white tongers shall be applied to the white school fund, and the sum from the colored tongers to the colored school fund. No license to tongers under the provisions of this act shall authorize the catching of oysters for sale during the months of April, May, June, July and August. And any person or persons violating the provisions of this section shall be subject to like penalties as are prescribed by the preceding sections of this act."

Sec. 11. *And be it enacted*, That every applicant for license under this act to use any canoe or other boat in catching oysters for sale with rakes or tongs shall be required to make oath or affirmation before the clerk authorized to issue the same, or some justice of the peace of the county, on whose certificate of the taking such oath or affirmation the clerk shall issue such license; said oath or affirmation shall assert that he has been a resident-citizen of the county for the twelve months next preceding his application; the length of the boat or canoe to be used; that he is the bona fide owner of said boat or canoe; that he will not violate the provisions of this act; that he will arrest and seize or assist in arresting or seizing all persons and boats, vessels and equipments engaged in violating the provisions of this act, so far as it may be in his power to do so, and that he will not employ or permit any person to use his boat or canoe so

licensed, or hire on shares, who has not been a bona fide resident-citizen of the county for the twelve months next preceding such employment or permission to use, and that he will inform against and prosecute all persons who violate this or any other provision of this act. The penalty for violating any of the provisions of this section shall be not less than ten dollars nor more than fifty dollars, to be recovered before a justice of the peace of the county, and said fine and costs of prosecution shall be a lien upon the boat and equipment of the offending party, which, unless paid within ten days after judgment, shall be sold under order and notice prescribed by the justice of the peace for the payment of such fine and costs, one-half of such fine to be paid to the county school commissioners and the other half to the informer."

"SEC. 12. *And be it enacted*, That every licensed tonger, under the provisions of this act, shall paint the number of his boat or canoe on the outside thereof, near the gunwale, on each side of the bow, in black figures of not less than four inches in length, and of proportionate width, in a white ground, and no number other than that in the license shall be exposed to view on said canoe or boat; and any person failing to comply with this provision, before using said boat or canoe for the purpose aforesaid, shall be subject to a fine of not less than five dollars, and not more than ten dollars, to be recovered and paid over as provided in section eleven of this act."

"SEC. 13. *And be it enacted*, That if any person shall use any boat or canoe not licensed, as provided by this act, in catching oysters with rakes or tongs, for sale, he shall be subject to a fine of not less than ten dollars and not more than fifty dollars, to be a lien on the boat or canoe of the offender, to be recovered and paid over as provided in section eleven of this act; and if said fine be not paid, he shall be imprisoned in the county jail for not less than two nor more than six months."

"SEC. 14. *And be it enacted*, That the Comptroller shall cause to be printed and delivered to the clerks of the circuit courts of the counties bordering on the Potomac River, the requisite number of such blank licenses as are required by the provisions of this act, and said clerks shall, on the first Mondays of March and December in each year, return to the Comptroller a list and account of such licenses issued by them; and no license to catch oysters with rakes or tongs shall be issued to any boat or vessel which is licensed to take oysters with scoop, dredge, tong or any similar instrument."

"SEC. 15. *And be it enacted*, That it shall be unlawful for any person to catch oysters on Sunday or at night with scoop, dredge, drag or similar implement, or by tongs; any person violating this section shall be fined a sum of not less than fifty dollars nor more than one hundred dollars, the fine and costs of prosecution to be a lien on the boat, vessel and equipments used in violating the provisions of this section, and the case shall be tried and disposed of, and the fine and costs collected and paid over as provided in section six of this act."

"SEC. 16. *And be it enacted*, That it shall be the duty of the officers of the State Fishery force, the sheriffs, constables and licensed tongmen of the counties bordering on the Potomac River, to arrest any person found violating the provisions of this act, and to seize all boats, vessels and equipments engaged or used in such violation, and to bring the offenders before a judge of the circuit court or justice of the peace most convenient or accessible, to be dealt with as by this act provided, and to hold such boats, vessels and equipments to be disposed of to secure the payment of such fines and costs of prosecution adjudged as hereinbefore provided by preceding sections of this act."

"SEC. 17. *And be it enacted*, That upon information given on oath to any judge or justice of the peace of any violation of any of the provisions of this act, he shall issue his warrant for the arrest of the offender and the seizure of the boat, vessel and equipments, which warrant shall be directed to the sheriff, constable or any licensed tongman of the county wherein such warrant is issued, or to any officer of the State Fishery Force, and said persons, when arrested, shall be carried before said judge or justice of the peace, and the boat, vessel and equipments shall be held to be dealt with according to the provisions of preceding sections of this act."

"SEC. 18. *And be it enacted*, That if any person or persons shall resist any officer authorized by this act to make arrests of persons and seizure of boats, vessels and equipments, he or they shall be deemed

guilty of a misdemeanor, and upon indictment and conviction in any court having criminal jurisdiction, shall be fined not less than one hundred dollars nor more than five hundred dollars, or be imprisoned in the House of Correction for not less than three months nor more than one year, or both fine and imprisonment in the discretion of the court; and the fine and costs of prosecution shall be a lien on any boats, vessel and equipments that may have been seized when such offenders were arrested, and such boats, vessel and equipment shall be disposed of to secure the payment of such costs and fine as the judge of the court may direct, according to the provisions of preceding sections in this act."

"SEC. 19. *And be it enacted*, That for all oysters bought and sold on the Potomac river the following shall be the standard bushel measure, viz: A solid iron tube, measuring sixteen and one-half inches across the bottom from inside to inside, eighteen inches across the top from inside to inside, and twenty-one inches from the inside bottom, diagonally, to the inside top. This measure, even full, shall be a bushel; and any person using a larger measure shall be subject to a fine of ten dollars for each and every offence against the provisions of this section, to be recovered by proceedings before a justice of the peace, one-half to be paid to the informer and the other half to the Comptroller of the State."

"SEC. 20. *And be it enacted*, That any person or persons feeling aggrieved by the judgment of any justice of the peace in any trial for a violation of any provision of this act may appeal to the circuit court for the county in which such case may have been tried; provided he or they give notice of such appeal within ten days after judgment, and shall within ten days after judgment pay the costs that have accrued, and deliver to said justice of the peace an appeal bond with two or more sureties, to be approved by said justice of the peace, executed to the State of Maryland, in the penalty of double the amount of fine or penalty adjudged by said justice of the peace, said bond to be conditioned for the successful prosecution of said appeal."

"SEC. 21. *And be it enacted*, That all money paid into the treasury of the State under the provisions of this act shall be placed to the credit of the "oyster fund."

"SEC. 22. *And be it enacted*, That the provisions of this act shall not apply to the citizens of the State of Virginia."

"SEC. 23. *And be it enacted*, That this act shall take effect upon the approval of this act, and the passage of a similar act by the State of Virginia."

"Approved March 15, 1880."

"CHAPTER 445."

"AN ACT to protect oysters in the waters of Pocomoke Sound, in Somerset county."

"SECTION 1. *Be it enacted by the General Assembly of Maryland*, That it shall not be lawful for any person or persons to employ any canoe, boat or vessel in catching or taking oysters with scoop, scrape, drag or dredge, or any similar instrument, within the waters of Pocomoke Sound, in Somerset county; nor shall any person or persons take or catch oysters for sale within said waters otherwise than with tongs, as restricted and regulated by the provisions of the General Oyster Law in force in this State."

"SEC. 2. *And be it enacted*, That any person or persons violating the provisions of this act shall be fined in a sum not less than seventy-five dollars nor more than one hundred and fifty dollars for each and every offence, and shall stand committed to the county jail until such fine and the costs of suit are paid."

"SEC. 3. *And be it enacted*, That on information made under oath of any violation of the provisions of this act to any justice of the peace of Somerset county, he shall forthwith issue his warrant to the sheriff or any constable of said county, requiring said officer to proceed forthwith to arrest the party or parties alleged to have been engaged in the violation of this act, and bring him or them before said justice at once for trial, and upon conviction shall be fined as required by section two of this act."

"SEC. 4. *And be it enacted*, That the said justice of the peace shall either give the case an immediate hearing, or at the instance of the party or parties charged, shall appoint some early day, within the next five days thereafter, to hear the case, the party or parties charged giving such good and sufficient bail

as said justice shall require for his or their appearance; and any party or parties feeling himself or themselves aggrieved by any conviction or judgment of said justice, shall have the right to appeal to the Circuit Court for Somerset county, which shall hear and determine the same as other cases on appeal."

"SEC. 5. *And be it enacted*, That this act shall take effect upon the consent and ratification of the provisions of this act by the Legislature of the State of Virginia, as required by the compact between the States of Virginia and Maryland, in the year seventeen hundred and eighty-one."

"Approved April 10, 1880."

In accordance with the resolution, which is given on page 54, the General Assembly of Maryland appointed John T. Bond, F. M. Lancaster and John H. Cooper, on the part of the Senate, and John H. Handy, Sydney E. Mudd and I. T. Costin, on the part of the House of Delegates, to confer with the following committee appointed under a similar resolution by the General Assembly of Virginia: William Mayo and H. A. Atkinson, Jr., on the part of the Senate, and E. S. Phillips, Charles E. Stuart and N. H. Champlin, on the part of the House of Delegates.

The two committees met in Richmond, on February 14, 1882, and agreed upon the following report:

First. That the following headlands on the Potomac River should be the points between which straight lines should be drawn as and for the true boundary lines between the States of Virginia and Maryland, under the award of J. S. Black and Charles J. Jenkins, arbitrators appointed by the said States, to fix the said boundary lines, to wit: Commencing at Smith's Point, drawing thence a straight line to Cupit's Island, thence westerly to Judith's Point (a point on Judith's Sound), thence westerly to Sandy Point, thence to Ragged Point, thence to Church's Point, thence to White Point, thence to the Upper Machodoc Point, and from Upper Machodoc to Persimmon Point, thence to Mathias Point, thence to Matomkin Point, thence to the land on the south shore abreast of Maryland Point, to a point on the Potomac creek opposite Marlboro' Point, thence to Brent's Point, thence to Clifton Point, thence to Cockpit Point, thence to Freestone Point, thence to High Point, thence to Hallowing Point, thence to Whitestone Point, thence to Perry Point, thence to Sheridan Point, thence along the south shore to Alexandria, thence to Hunter's Point, thence to Gravelly Point, following the south shore and the meanderings of the river to the line of West Virginia and Virginia.

Second. That oyster dredging should be prohibited in the Potomac River west from a line drawn from Point Lookout, in Maryland, to the headland of Smith's Point, in Virginia.

Third. That oyster dredging should be prohibited in Pocomoke Sound.

Fourth. That common rights of fishing and oystering shall be enjoyed by the citizens of both States in that part of Pocomoke Sound north and east of a straight line, commencing at Watkins' Point, and running thence in a southeasterly direction to buoy R, number four, as it is now located upon coast chart number thirty-three, of the United States Coast Survey (sheet number three, Chesapeake Bay, and chart No. 4 of this Report of the Maryland Oyster Commission), filed as a part of said award of said Black and Jenkins, making off from a shoal from Mesongo creek; thence with a straight line to the northern boundary of said creek. No rights in any creek or inlet granted hereby by either State, and the riparian rights upon the shores of said sound to be respectively protected in same manner as is provided for in the Potomac River by the compact of seventeen hundred and eighty-five. This line to be no longer binding if dredging is authorized by either State.

Fifth. That there shall be concurrent jurisdiction between the States of Maryland and Virginia, by which the violators of the oyster laws may be punished in either State. That a concurrent law be passed restricting the taking of oysters for any lawful purpose in the Potomac River and that of Pocomoke Sound covered by the concurrent act, from the first of October to the first of May; and that they be taken for planting or bedding, and may be planted or bedded in the waters of either State up to and including May fifteenth, and during all of September; and strictly prohibiting their being taken for sale or planting from May fifteenth to September first; provided, however, they may be taken to be eaten within the county where taken at any time.

The said committees have recommended that the following act be passed to ratify and carry out the said agreement, entered into by them with each other, subject to the action of their respective Legislatures, as is witnessed by their signatures subscribed as follows:

WILLIAM MAYO,
H. A. ATKINSON, JR.,
On part of Senate of Virginia.

E. S. PHILLIPS,
N. H. CHAMPLIN,
CHARLES E. STUART,
On part of House of Delegates of Virginia.

JOHN THOMAS BOND,
F. M. LANCASTER,
JOHN H. COOPER,
On part of Senate of Maryland.

JOHN H. HANDY,
ISAAC T. COSTEN,
SYDNEY E. MUDD,
On part of House of Delegates of Maryland.

The following is a copy of the act which the commission recommended. It was approved by the General Assembly of Virginia on March 1, 1882, to go into effect as soon as a similar act should be passed by the General Assembly of Maryland:

"1. *Be it enacted by the General Assembly of Virginia*, That the boundary lines between the States of Virginia and Maryland, upon the Potomac River, as found by the award of Jeremiah S. Black and Charles J. Jenkins, arbitrators aforesaid, shall and the same are hereby declared to be as follows: Commencing at Smith's Point, drawing thence a straight line to Cupid's Island; thence westerly to Judith's Point, a point on Judith's Sound; thence westerly to Sandy Point; thence to Ragged Point; thence to Church's Point; thence to the Upper Machodoc Point, and from Upper Machodoc to Persimmon Point; thence to Mathias Point; thence to Matomkin Point; thence to the land on the south shore abreast of Maryland Point to a point on the Potomac creek, opposite Marlboro' Point; thence to Brent's Point; thence to Clifton's Point; thence to Cockpit Point; thence to Freestone Point; thence to High Point; thence to Hollowing Point; thence to Whitestone Point; thence to Perry Point; thence to Sheridan Point; thence along the south shore to Alexandria; thence to Hunter's Point; thence to Gravelly Point, following the south shore and the meanderings of the river, to the line of West Virginia and Virginia."

"2. *And be it further enacted*, That it shall be unlawful for any person or persons or body corporate to dredge for oysters in the waters of the Potomac river above a straight line commencing at Point Lookout, in Maryland, and running thence across said river to the headlands on Smith's Point, in Virginia, mentioned in the first section of this act."

"3. *And be it enacted*, That it shall be unlawful for any person or persons or body corporate to dredge for oysters in any of the waters of the Pocomoke sound."

"4. *And be it enacted*, That in consideration of the mutual concession of rights made by the States of Virginia and Maryland, hereinafter in this section provided, that the citizens of each of said States shall have equal and common rights of catching and taking fish and oysters in all the waters of the Pocomoke Sound lying north and east of a straight line commencing at Watkin's Point, in Maryland, and running thence in a southeasterly direction to buoy R, number four, as it is now located upon the coast chart, number thirty-three, of the United States Coast Survey, sheet number three, Chesapeake Bay, filed with said award of said Black and Jenkins, making off from a shoal from Messongo creek, and

a straight line commencing at the end of the aforesaid line and running by the shortest straight line thence to the northern boundary line of said creek; provided, nevertheless, that neither of the said States, nor the citizens thereof, shall have, or be deemed to have acquired, by reason of anything in this act contained, any rights in any creek or inlet making into or bounding on said sound; and provided further that the riparian rights of the said States, respectively, and the citizens thereof, shall be the same, with the same limitations and restrictions as exist by virtue of the compact between the said States, made in the year seventeeen hundred and eighty-five, to which reference is hereby made for the same; and provided further, that if either of said States shall fail to prohibit, or having prohibited dredging in any part of Pocomoke sound shall repeal the same, then, and in that case, this section shall be no longer binding on the other."

"5. *And be it enacted*, That both of the said States of Virginia and Maryland shall have concurrent jurisdiction over all offences against this act, committed upon the waters described in the fourth section of this act, as well as in the Potomac river, and that the officers of either State who may be empowered by the laws of said States, respectively, to enforce this act, shall arrest any person or persons charged with the violation of any of the provisions thereof, the said person or persons so arrested shall be taken by the officer making such arrest and delivered for trial to the proper authorities of the State of which they may be citizens; and if any of the said persons so arrested be not citizens of either of said States, then such persons shall be taken and delivered for trial to the proper authorities of the State whose officer makes such arrest, unless there be at the same time citizens of either of the said States arrested as participants in said offence, in which case said non-resident offenders shall be delivered for trial to the proper authorities of that State whose citizens are at the same time arrested as participants in the same offence."

6. *And be it further enacted*, That it shall be lawful to collect or take oysters for any lawful purpose in the Potomac River, and that part of Pocomoke Sound covered by the fourth section of this act, from the first day of October to the first day of May; and that it shall be lawful to take oysters in said waters for the purpose of planting or bedding only; and that they may be planted and bedded in the waters of either of the said States up to and including the fifteenth day of May, and during all the month of September; and that the collecting and taking of oysters, whether bedded or not, in any of said waters, for any purpose whatever, shall be unlawful from the fifteenth day of May to the first day of September, provided that nothing in this act shall be construed to prohibit the collecting or taking of oysters in any of said waters, at any time, to be eaten within or opposite the county wherein taken."

"7. *And be it enacted*, That if any person or persons, or body corporate, shall take or catch oysters with dredges, or instruments other than oyster tongs, within the waters described in this act, upon conviction, he, they, or if a corporation, it and its agents and servants, shall be punished according to the provisions of the law in that case made and provided for by the State or commonwealth where said conviction may be had, provided that in no case shall the punishment be less than one nor more than three years' imprisonment in such place as may be by the law of said State or commonwealth provided, and forfeiture of the vessel, boat or craft, its tackle, furniture and apparel, to be disposed of as may be provided by the laws of said State or commonwealth."

"8. *And be it enacted*, That if any person or persons, or body corporate, shall violate the laws of said States respectively with regard to catching or taking oysters with tongs in the waters described in this act, he, they, and if a corporate body, it and its agents and servants, shall, upon conviction, be punished according to the laws of the State or commonwealth where such conviction is had."

"9. *And be it enacted*, That all acts and parts of acts inconsistent with the provisions hereof are hereby repealed."

"10. *And be it enacted*, That this act shall go into effect from a date a similar act may be passed by the General Assembly of Maryland and become a law of said State."

It will be observed that this act, as printed and punctuated by the Auditor of Public Accounts of

Virginia, says, "*That it shall be lawful to take oysters in said waters for the purpose of planting or bedding only*" (section 6); while the recommendation of the commissioners simply says that they may be taken for this purpose during all of September, and from May first to May fifteenth, while the beds are closed at these times for all other purposes. In this respect the law of Virginia, as now worded and punctuated, does not express the views of the commission.

While Virginia has, with this exception, shown her willingness to accept the decision of the commission, our own General Assembly rejected their report, and on May 3, 1882, adopted the following law:

"CHAPTER 391."

"AN ACT to regulate the taking and catching of oysters in the Potomac River within the boundary lines of the State of Maryland."

"SECTION 1. *Be it enacted by the General Assembly of Maryland*, That it shall be unlawful for any person whatever to take or catch oysters in the waters of the Potomac River within the boundaries of the State of Maryland as fixed by the award of the arbitrators—Jeremiah S. Black and Charles J. Jenkins—appointed by the State of Maryland and the State of Virginia to ascertain and fix the boundary lines between said States, in any boat or vessel with scoop, drag, dredge or other similar instrument, until after such person shall have first obtained from the Comptroller of the Treasury a license as provided by article seventy-one of the Code of Public General Laws of this State, to take or catch oysters in the waters of the Chesapeake Bay in the boat or vessel so licensed; and all licenses hereafter issued by the Comptroller to take or catch oysters with scoop, drag, dredge or other similar instrument, in the waters of the Chesapeake Bay, in any boat or vessel named in such license, shall be so written or printed as to include the waters of the Potomac River within the boundary lines of the State of Maryland and below Blackstone Island, in said river, and shall authorize the taking or catching of oysters by such person in such boat or vessel, in such waters of the Potomac river below said Blackstone Island, at such times and in such manner as may be authorized by such article of the Code of Public General Laws as now in force, in the waters of the Chesapeake Bay, in this State."

"SEC. 2. *And be it further enacted*, That any person violating any of the provisions of the preceding section shall be deemed guilty of a misdemeanor, and, upon conviction thereof before any judge or justice of the peace having jurisdiction, shall be liable to and shall suffer the same fines and penalties prescribed against dredging without license in the waters of the Chesapeake bay in this State."

"SEC. 3. *And be it enacted*, That it shall be the duty of the commander and deputy commanders of the oyster police of this State to arrest any and every person violating the provisions of this act, and carry such person before a judge of the circuit court or justice of the peace most accessible and convenient; and any judge or justice of the peace of this State, before whom such offender may be so carried, shall have jurisdiction to try and determine the said offence; provided that any person so tried and convicted shall have a right of appeal to the circuit court of the county where tried, in the same manner as is provided by article seventy-one of the Code of Public General Laws of this State, as now in force."

"SEC. 4. *And be it enacted*, That it shall not be lawful for any person to take or catch oysters in the Potomac river within the boundary lines of the State of Maryland, with tongs, without first obtaining a license therefor, as provided for in article seventy-one of the Code of Public General Laws of this State; but any citizen of the State of Maryland, who has been a *bona fide* resident of the State for one year, shall be entitled to obtain the said license upon complying with the other requirements of the said article of the Code of Public General Laws; any person presuming to take or catch oysters with tongs in the Potomac River within the boundary lines of this State, without license as aforesaid, shall be subject to all the pains and penalties provided by article seventy-one of the Code of Public General Laws against the illegal catching of oysters with tongs in the waters of this State; provided, however, no such license

shall authorize the taking or catching of oysters in any water not over twelve feet in depth, with scoop, dredge, or seine, or other instrument, in any creek, inlet or tributary of said river."

"SEC. 5. *And be it enacted*, That this act shall take effect from and after the date of its passage."

"Approved May 3, 1882."

Right or wrong, constitutionally or unconstitutionally, this is now a law of Maryland, and should either be enforced or repealed at once.

If our State is the lawful owner of the oyster fisheries of the Potomac River, we should enforce and maintain our rights, and on the other hand, if the citizens of Virginia have, in common with our people, the right to these fisheries, our State should at once repeal this law and adopt the recommendations of the commission of 1882.

It should be easy to test this question, and we therefore recommend that, if the act of May 3, 1882, is not immediately repealed, another law be passed, directing one of the steam vessels of the State Fishery Force to proceed forthwith to the Potomac River, to arrest all persons found taking oysters in the Potomac without license from the State of Maryland, and to seize all boats and apparatus so used, and to convey the same to a justice of the peace or a judge of the Circuit Court, to be dealt with according to the provisions of the act of May 3, 1882.

Your commissioners are not qualified to give an opinion upon the legal ownership of the oyster fisheries of the Potomac, but they wish to call attention to the fact that our State has, by two separate legislative acts, recognized, since the award of 1877, the rights of the citizens of Virginia. Thus section 22 of the act of March 15, 1880, says that *the provisions of this act shall not apply to the citizens of the State of Virginia;* and joint resolution No. 17, of January, 1882, says that *chapter thirty-six "(of)" an act concerning the taking and catching of oysters in the Potomac River * * * requires the assent of the General Assembly of the State of Virginia, under the compact between the States of Maryland and Virginia, in the year seventeen hundred and eighty-five, that the same may become effective.*

Whatever view is the true one, we cannot express in too strong terms our regret for the vacillating policy of a Legislature which in January appoints from among its members a commission to meet the commission of a sister State, to adopt measures for the protection of common property, and in May of the same year, decides (act of May 3, 1882) that this sister State had at that time no interest in the property.

It is claimed that Virginia, by adopting the recommendations of the joint commission, and by passing the law of March 1, 1882, has revoked the compact of 1785; but this law, like the Maryland law of March 15, 1880, or two years before, contains the provision that it shall not take effect until it shall be approved by the other State, and it clearly has no bearing whatever upon the ownership of the Potomac beds.

Our rejection of the report, upon this ground, after the appointment of the commission, is more worthy of a pettifogging lawyer than of the Legislature of an honorable State.

The position of Maryland in this matter is childish and undignified in the extreme, and in a very unfavorable contrast to the attitude of Virginia, although the general oyster policy of the latter State is no more satisfactory than our own.

The laws of Virginia upon the oyster industry are fully as unwise and inefficient as our own, and your commissioners do not believe that our State should adopt the system which Virginia now employs, but the question with reference to these waters now is "protection or no protection." So long as these waters are without some legal protection, however unsatisfactory, it will be impossible for our Fishery Force to enforce our laws in other parts of our waters, and it is clear that the responsibility for this state of things rests with our own people.

The policy of prohibiting dredging is unwise, and the closed season, according to the law of Virginia,

is different from the one at present legalized in Maryland, but these considerations are of trifling importance compared with the necessity for securing protection of some kind for our border beds.

Your commissioners had no direct interest in oyster legislation at the time the subject was discussed by the General Assembly, and they therefore know nothing regarding the discussion, but the following letter from Joseph B. Seth, of Talbot county, which appeared in the Baltimore *Sun* of December 8th, 1883, gives the reasons which are said to have led to the rejection of the report:

"A prominent subject of discussion in the papers for a day or two past has been the question of the oyster interests of the States of Maryland and Virginia in relation to the Potomac River. While I admit that the action of the Legislature of the respective States during the session of 1882 is correctly stated by Gov. Cameron, I find that he, and in fact the public generally, fail to appreciate the condition of the subject which led to the action of the Maryland Legislature at that session, and therefore request the use of your columns for a brief explanation in justification of that action, and not having been a member of that body, I feel that I can do so impartially."

"Few persons in our State have studied this question or are properly informed of its status."

"The question of boundary line between the two States was long an open and embarrassing one, and gave rise to repeated conflicts and troubles in relation to the fisheries of the Potomac and Pocomoke, and in order to avoid these repeated conflicts and troubles the two States entered into the compact of 1785, by which the citizens of the two States were permitted to use the said rivers for fishery in common. At the time of this action the oyster question was of little or no importance, and did not come into notice for more than half a century thereafter. We must bear in mind that this compact embraced the Potomac and Pocomoke Rivers, and our people contend that the term river, as then used, was intended and did embrace what is now called Pocomoke Sound, while Virginia restricts the term to the upper and narrow part of the stream, which is almost barren of oysters."

"It is true that the representatives from Somerset county fought the report of the committee because their citizens are most interested, but their fight was the fight of this State."

"The grounds of opposition are; First, that by the Graham-Black award of 1877 the boundary line has been fixed, and the binding force of the compact of 1785 been annulled, and all necessity for its existence removed. Second. That if the compact is to continue in force it should secure to the citizens of Maryland the rights of fishery in common in the Pocomoke in accordance with the spirit and intention of the compact at the time it was made; and third, that the bill as reported in 1882 would put it entirely beyond the power of the State of Maryland ever again to have opened the question without the concurrent action of the State of Virginia, which could not be had. For this reason the House of Delegates in 1882 refused to pass the bill reported, and subsequently passed the bill introduced by Mr. Miles, which bill assumed the control of the Potomac under the award and legislated in relation thereto as if it was our separate property, and I sincerely regret that during the two years just passed the question has not been carried, under that bill, to the Supreme Court, and the question of jurisdiction judicially settled."

"I think our Legislature acted wisely. If the Potomac belongs to Maryland let us know it and so treat it. The question of the oyster fisheries of the Potomac will always be one of great perplexity and trouble if the two States are required to legislate jointly upon it, and we will never have anything satisfactory. It cannot serve two masters. I admit the importance and necessity for legislative protection, but do not think our people should act hastily. The Supreme Court of the United States has decided that the oyster laws of Maryland are constitutional, and that the State has exclusive control of the bottoms of all bays, rivers and streams within the limits of its territory, so if the Potomac is ours, let us know it. So we should also know our rights in the Pocomoke and not lightly throw them away."

"My advice would be to pass a joint act of protection, limited in duration, say to four years, and which would terminate without the action of either State, and during that time have the relative rights of the two States judicially determined. The oyster question will be the most prominent one before the

Legislature of 1884, and I think they will be fortunate in having before them the views of all classes interested. Private interest must be laid aside and the question dealt with as the great commercial industry of the State."

With regard to the claim that Pocomoke Sound should be open to the citizens of both States, we must recollect that while the Potomac and Pocomoke Rivers are bounded on one side by the land of Virginia and on the other by the land of Maryland, the whole of Pocomoke Sound south of the latitude of Watkins' Point lies entirely within the boundaries of Virginia, according to the award of 1877, as well as by the compact of 1785, and by the charter of Lord Baltimore in 1632. None of these boundary lines recognize any right on the part of Maryland to any lands south of Watkins' Point, but a reference to Chart No. 4 of our report will show that the report of the Commission of 1882 does give to our people the right to fish for oysters upon a very considerable area south of the boundary.

The report, which has been accepted by the State of Virginia, gives to us the right to fish anywhere to the northward and eastward of a line from Watkins' Point, which is on the boundary, to Red Buoy No. 4, which is entirely in Virginia, and from this buoy to the north point of Messongo Creek, which is also in Virginia.

A reference to the chart which accompanies this report will show that more than half of the productive oyster area which is open to the people of both States in Pocomoke River and Sound lies to the south of the boundary, and actually in Virginia. So far as this area is concerned the report of the joint commission of 1882 is a liberal compromise on the part of Virginia.

The simplest solution of the difficulty would be the recognition of the right of each State to exclusively control the bottoms within its own boundaries; but we should by this lose more in Pocomoke Sound than we should gain there.

If the Potomac River oyster grounds belonged entirely to us, we should not lightly throw our rights away; but the enactment of a law to prohibit dredging in the river, and to adopt the Virginia closed season would not do this, and as we have already recognized by the compact of 1785 the right of Virginians to fish in these waters, the acceptance of the report of the joint commission would not change matters.

As the law of Virginia is annulled by the passage of our law of May 3, 1882, we recommend that our Legislature pass a law prohibiting dredging in the Potomac and Pocomoke Rivers, and in Pocomoke Sound, and adopting the Virginia closed season, and that the necessary steps be taken to secure the ratification of this law by Virginia.

We also recommend that the ownership of the oyster fisheries of the Potomac within our own boundaries be decided, and that if these beds belong in common to the people of both States, a joint commission be appointed to prepare and recommend measures for their protection and development.

Section VII.—On the Oyster Fisheries of Tangier Sound.

Your commissioners believe, as the result of their personal examination of the working of the State Fishery Force, that one of the most serious hindrances to the thorough enforcement of our laws, is the existence of local laws giving to certain counties the right to permit dredging without a license from the State.

The history of this subject is as follows: In 1874 a law was passed (chapter 437) which, as amended by chapter 405 of the act of 1876, and chapter 359 of the act of 1878, gives to the clerks of the Circuit Court of Dorchester and Talbot counties the right to issue to any resident of these counties a license to use any boat of not more than ten tons capacity for dredging in certain specified waters of the Choptank River upon the payment of two dollars per ton annually.

The act of 1874, chapter 214, as amended by chapter 325 of the act of 1878, and by chapter 327 of the act of 1882, gives to the clerk of the Circuit Court of Dorchester county a similar right to issue to

residents of the county licenses to dredge, with boats of not more than ten tons capacity, in specified portions of the Choptank River and Tangier Sound and its tributaries.

The act of 1867, chapter 129, permits any citizen of Somerset county, who holds a State license to dredge in the Chesapeake Bay, to obtain from the clerk of the Circuit Court, upon payment of ten dollars annually, a license to dredge for oysters in the waters of this county.

These laws seem to be worded with sufficient care, and the practice of apportioning our oyster lands out among the counties would be a good one if the counties could be relied upon to preserve the beds from destruction and to enforce the laws. It is plain, however, that the people of the State at large should not be taxed to support a navy for the protection of property of which certain counties have the exclusive use, and which pays no revenue to the State Treasury. Your commissioners also submit that they find, by personal examination, that the local laws are not enforced.

In November, 1882, we visited the waters of Dorchester and Somerset counties, on Tangier sound, and found upon the beds hundreds of vessels, of more than ten tons capacity, engaged in dredging for oysters without displaying a State license number, as required by law. In one day we counted eighty-six vessels thus engaged, and in both Dorchester and Somerset counties the average size of the dredging vessels was about that of the vessels which dredge, under State license, in the bay. Out of more than one hundred, not one was within the legal limit of ten tons capacity. We failed to find among these vessels a single one which was licensed, as required by the local law. It is true that we did not overhaul and question all of them, as this would have consumed all our time, and would have defeated the object of our visit, the examination of the condition of the beds.

At our request the commander of the Fishery Steamer Leila, arrested the captain of one of these boats, and took him before a magistrate. We were unable to remain to hear the conclusion of the case, but we were afterward informed that the offender was promptly acquitted.

We were informed by Geo. T. Rowe, magistrate, of Deal's Island, Somerset County, that he himself issued 250 local dredging licenses in 1881, and that this year, 1882, he knew personally of only two dredgers in his district, who had conformed to the law and taken out licenses.

In view of these facts we recommend that the State assume the exclusive right to license and regulate dredging within our waters, and that all laws conferring this power upon local authorities be repealed.

In our examination of the oyster beds we accidently discovered a practice which is so dangerous that it should be prohibited by law. A dredger who was arrested by Capt. Mitchell at our request, said that he had not yet received his license, but that he had paid his license money to the commander of the fishing sloop of his district, although he had no receipt to show. We afterwards found the commander of this sloop, and when brought aboard the steamer and questioned he admitted that he did sometimes receive the money for licenses in this way, but that he took out the licenses as soon afterwards as possible, and retained them in his possession until he had an opportunity to deliver them. He also said that, in such cases, he did not usually give a receipt, as the dredgers were acquainted with him, and wanted none.

We do not affirm that this practice is followed in order to evade the laws, but we respectfully submit that the temptation for the dredger to compound with the fishery officer for immunity from arrest is very strong, and we recommend that a law be passed to declare that no vessel shall be used to take oysters in this State, unless it shall have on board, at the time it is thus used, the license required by law, and that the penalty for the violation of this law shall be the same as the penalty for dredging without a license, and we also recommend that any fishery officer who shall receive a license fee from an oyster fisherman, without at the same time delivering to him his license, shall forfeit his bond to the State, and shall be removed from his position, and shall not again be employed upon the fishery force.

Section VIII.—On the State Revenue from the Oyster Industry.

While this subject does not come strictly within the province of the Commission, we feel that our work in the field has given us opportunities to make suggestions which may serve to increase the revenue. As long as our present policy of raising revenue by licenses is adhered to we cannot expect any very great increase, and the depletion of the beds must, in any case, affect the income of the State. We believe that the true interest of our people demands private cultivation, and as this will increase the amount of productive and taxable real estate, it will enlarge the most important source of public revenue.

In the meantime certain changes should be made in our present policy.

As there are six or seven hundred dredging vessels, all of them very much alike in appearance, the only way for the officers to determine whether dredging boats have complied with the license law is to observe whether they display license numbers, and it is assumed that any boat which is numbered is also properly licensed.

As a duplicate number can be made by any one with a paint brush and a little black paint, there must be a strong temptation to evade the law by counterfeiting the numbers or by using old ones, after the license has expired.

We therefore recommend that each officer of the fishery force be required to keep a daily record of the numbers of all dredging boats in his district and of the beds upon which they are working, and to transmit a copy of this record, once a week, to the Oyster Commissioners, who shall be required to enter, in a book kept for the purpose, after the number of each dredging boat, the place where it has been seen on each day. Whenever this record shall show that the same number has been seen in one day at two distant points, the commander of the fishery force shall issue an order to all officers to overhaul all vessels which exhibit this number and to examine their license.

We also recommend that, as the State bears all the expense of protecting the tongmen, all money received for tonging licenses and all fines received for the violation of the oyster laws be paid to the State Treasury, to the credit of the oyster fund.

Your Commissioners do not believe that, even under our present oyster policy, our method of raising revenue is the best one. Nearly nine-tenths of our oysters are consumed outside our State, and we believe that the revenue and the expenses of enforcing the laws should fall upon these consumers, rather than upon our own people. We do not recommend any change, but we beg leave to call attention to the subject, and to suggest that the repeal of the license laws and the imposition of a tax upon all oysters handled by wholesale dealers would cheapen oysters to our own people, and would put most of the expense upon consumers outside our State.

Section IX.—On the Advisability of Dividing our Oyster Area into Open and Closed Districts.

We have shown, in a preceding section, that we cannot hope for any marked improvement in the condition of our oyster beds through the enforcement of laws closing them for certain months in the year.

The rapidly increasing demand for oysters must be supplied in one way or another, and the effect of a closed season is simply to gather the oystermen upon the beds in greater numbers than ever at the end of the season.

This is equally true whether the closed season is long or short. If our waters, or any part of them, should be closed to the public for a term of years the oysters would increase and multiply and finally restock the beds. It is difficult to state exactly how long a time would be required, as this depends upon the condition of the beds. When there are plenty of mature oysters to supply the spat, and plenty of clean shells for the young to fasten upon, a few years will suffice to restore the bed, but

after an oyster bed is thoroughly exhausted there is no reason why another natural bed should ever grow up in the same spot rather than anywhere else, and in any case the closure of certain districts cannot increase the supply beyond its natural limits. In certain parts of France the oyster territory has been divided into sections, and each section is fished in turn while the others are closed and left to repair their losses. We are told by a recent French writer that while the provinces which have made use of this system have been able to preserve their beds from complete ruin they have not been able to increase their fruitfulness or to restore them to their ancient splendor.

Even if the waters are loaded with spat from adjacent beds, there is no reason why the young should gain a foothold on the site of the exterminated bed. Between the natural beds there are areas where the bottom is perfectly adapted for oysters, except that there is nothing for the spat to fasten to, and an exterminated natural bed is in the same condition.

The regrowth of such a bed is, therefore, exactly like the original formation of a natural bed, and it must be a very slow process indeed; how slow it is very difficult to say, as we have very little information which will help us to decide, although we have facts to show that a century may not be long enough.

When New England was settled there were very many valuable beds between Cape Cod and the northern limit of our coast. Many of these beds were destroyed so long ago that we have no records of the date when they ceased to be productive, and others were yielding oysters about one hundred years ago. There are still a few scattered oysters at certain points on the coast, and we can be sure that the conditions are still favorable, but there is no evidence to show that any of these beds have become restocked, although some of them have certainly been untouched for two hundred years or more. It is possible that the beds which were discovered by the United States Coast Survey in 1874, near Plymouth, New Hampshire, have grown there since the oysters were exterminated, a hundred years before. This region was renowned among the Indians for its oysters, and in 1697, a river emptying into the bay was known as Oyster River. One hundred years ago a number of vessels were loaded with oysters there, but since that time the region has yielded no oysters until 1874, when the officers of the United States Coast Survey found about a dozen large beds or clusters of beds in about ten feet of water.

It is impossible to state whether these beds occupy the place of the beds which were exterminated a century ago, but it is probable that most of the old beds were in shallow water. The bay must have contained enough oysters to furnish spat, and as no new beds have grown up in shallow water, we are forced to conclude that, even when spawn is present, a period of a hundred years is not enough to restore a bed which has been completely destroyed.

Very fortunately for us none of our own beds are as yet completely destroyed, and there is still an abundance of spat in our waters, and while the shells are nowhere as abundant and clean as they should be, most of our beds could, in all probability, be restored to a tolerably prosperous condition by five or six years of rest.

It is important, however, to keep clearly in mind the fact that this remedy would not meet the real difficulty, as it could, at the best, do no more than restore the natural supply. It would do nothing to increase the supply beyond its natural limits, and as the demand is now far in excess of the natural productive power of our waters, the restored beds would very soon be again exhausted and left in a worse condition than ever.

The adoption by the State, of a plan to close certain districts long enough for the beds to recover, would, undoubtedly, delay the work of extermination, but it would also cause an immediate decrease in the supply.

We believe that if our present policy is continued, measures of this kind must be adopted, but we believe that such an expedient can have only a temporary value, as it will do nothing in itself to enlarge our oyster area, or to increase the productiveness of our waters.

Your commissioners recommend this plan, not as a remedy for the evil, but as a means for arresting the destruction of our oyster property until better methods can be introduced.

We believe that the districting plan is neither a real remedy nor the best method for arresting the destruction. It is the best which can be put into force without delay, but while recommending it, we feel that it is our duty to call attention to the fact that there is a still better method, although it is one which would require considerable time, and the expenditure of large sums of money.

Under natural conditions each bed is able to yield a certain number of oysters each year, and whenever this number is exceeded the bed suffers, and if the practice is continued it must be destroyed. It makes no difference whether the oysters are taken in one month or in twelve, or in one year or in five. The ultimate effect upon the bed is the same in all cases.

In the absence of measures for artificially increasing the productiveness of the oyster grounds, or even when such measures are employed, the only way to effectually protect a bed is to examine it each year, and to learn how many oysters it can furnish without injury, and to take such steps as may be necessary for preventing each bed from being drawn upon in excess of its capacity.

When the natural beds are small and few in number, it is easy to do this, and the plan has been employed in some parts of our own country, and also in many parts of Europe, where a few guard boats are enough to protect the beds and to learn how many oysters are taken from each one.

The waters of Maryland cover nearly one-third of the whole area of the State, and as oyster beds are found in nearly all our waters, there are very great practical difficulties; and the attempt to learn how many oysters are taken, and how many should be taken from each bed, demands great executive ability and a large and well trained and equipped police force. Our present Fishery Force is totally incompetent to undertake such a work, and no force could do it efficiently without devoting two or three years to organization and to preliminary work.

The restriction of the crop according to the capacity of the bed is absolutely necessary, and it must be brought about in one way or another.

The result can be reached by a system of intelligent private cultivation upon grounds held for the purpose upon long leases, or deeded outright by the State; for personal interest is the strongest motive which can exist to prevent the needless destruction of property.

If all our oyster area were divided up into private holdings, the whole could be watched and its condition and capacity much more carefully and exactly ascertained, than can ever be the case under State management, and an enlightened system of private cultivation would be the most sure safeguard against the exhaustion of the beds.

The most enthusiastic advocate of private cultivation can have little hope of witnessing such a change as this in our oyster policy very soon, and the history of the wanton destruction of the timber lands of all parts of the Eastern United States shows that even private interest may, in the absence of sound education, fail to produce the desired result.

In any case we cannot look for efficient protection from this source immediately, and in the meantime the State should provide, as quickly as possible, for the annual examination of each bed, and it should ascertain each year how many oysters each bed can furnish without injury, and it should enact laws to prevent this amount from being exceeded, and it should furnish means for enforcing these laws.

We do not believe that there is at present any person who could do this wisely and efficiently, and we believe that the oyster interests should be put for a term of years into the hands of a commission

composed of competent persons, who should be employed to study the subject and to gain the experience which is needed for devising a practical method of protection.

The first step, the survey of all the beds and the construction of accurate maps, would employ a large and well equipped force for several years.

In another part of our report a plan for reorganizing the State Fishery Force will be found. This plan has been drawn up by one of your commissioners who is well fitted, by his past training, for handling the subject; and if his recommendations are adopted the oyster beds could be surveyed and mapped, in two or three years, without great expense to the State. After all the beds are mapped, a large force will still be needed to make the annual examinations, and for obtaining the data which are needed to determine how many oysters each bed can yield without injury.

The enactment and enforcement of the necessary laws would even then present many difficult and complicated problems, but if our public beds could be placed for a term of years under the supervision of an officer or a commission to study the subject, and to superintend and direct the survey and examination, and to develop a plan for protection; and if competent persons could be found to devote themselves to this work; and if an efficient navy, under the command of trained officers, could be employed to act under their supervision and direction, a practical and efficient plan could no doubt be devised and put into execution within two or three years.

The expense would of course be considerable, but it would soon be repaid to the people of the State. The magnitude of our oyster industry and its almost unlimited possibilities, seem to demand the organization of such a department, but the State could not expect an immediate return for the expense.

No efficient plan for the annual examination and thorough protection of each bed can be put into force without two or three years of preparatory work, such as surveying and mapping the beds, organizing and training the force, and studying the problem and devising and enacting laws.

In the meantime something may be done by more simple means, and we accordingly submit a plan, which should be adopted immediately, for dividing our waters into districts.

As it is impossible to state, at present, how long it will take for any particular bed to become restored, we recommend that certain areas be closed for an indefinite time, and that no one be allowed to take oysters within these areas until examination shows that they are sufficiently restored.

The closure of a part of our waters will, of course, diminish the supply of oysters, and we therefore believe that the total area which is closed should be only a small part of the whole oyster area.

It is plain, also, that if the whole of the closed area were in one place the residents of the lands bordering upon it would be unfairly treated, as they would be compelled to go to a great distance for their oysters.

We therefore recommend that, to meet these difficulties, the system of districts which is shown in colors upon the accompanying charts, and which is more exactly described in another part of this report, be adopted.

We recommend that our waters be divided into two areas: "A Shore Oyster Fishery," which is colored blue, and a "Deep Water Oyster Fishery," which is colored red and yellow. We recommend that no dredging be permitted within the blue area or "Shore Oyster Fishery," but that this be reserved for tongmen and planters exclusively, although we recommend that a licensed tongman be also allowed to take oysters on any grounds where dredging is permitted.

We also recommend that one-third of the total area of the "Deep Water Oyster Fishery" be absolutely closed to the public for an unspecified time, and that this closed third be divided into five narrow belts across the bay, separated from each other by wider belts where dredging shall be permitted as at present. On the charts the five narrow closed districts are colored red, and the six open districts are colored yellow.

The yellow area is therefore the only part of the bay and its tributaries where we recommend that dredging be permitted.

If this plan is adopted, the dredging ground will be considerably reduced, and the supply of oysters for a few years will be diminished, but there is no help for this until the supply is increased by artificial cultivation.

We also recommend that a proper seaworthy steamboat, under competent officers, be kept upon duty at all times, by night as well as by day, on each of the six open districts, which are colored yellow, to prevent unlicensed dredging, and to protect the shore oyster fishery from the depredations of dredgers, and to guard the closed areas, and to survey and examine the oyster beds.

We also recommend that a steamer be placed upon the Potomac river for the same purpose, and that an extra steamer be kept in reserve, to relieve any disabled boat, and to be used by the commander of the Fishery Force in inspecting the work of his subordinates, and to be used by the oyster commission in their examinations.

We have already called attention to the fact that this districting plan will not in itself lead to any permanent improvement, and that it is nothing but a temporary expedient to arrest the destruction of our beds.

In another part of our report we therefore recommend that active measures be employed to increase the supply of oysters by artificial means, upon two of the closed districts, and we also recommend that any person who is authorized to appropriate ground for the cultivation of oysters under the five-acre law, be permitted to select these five acres within the closed districts.

CHAPTER VI.

OYSTER PLANTING.

Oyster planting is the placing of small or "seed" oysters upon bottoms which are favorable to their growth. There are many bottoms where there are no natural oysters, simply because there is nothing upon the ground for the spat to catch upon, or because they are not in places to which spat is carried, and there are other bottoms which are so soft that a very young and small oyster would be buried in the mud and killed, although larger ones are able to live and thrive in the mud. In all these places oyster planting can be carried on with profit, for while it is true that the total number of oysters which are born is not increased by planting, the number which reach maturity is greatly increased, for the young oysters fasten themselves so close together and in such great numbers, that the growth of one involves, under natural conditions, the crowding out and destruction of hundreds of others, which might have been saved by scattering them over unoccupied ground.

Planting also adds very greatly to the value of oysters, as they grow more rapidly and are of better quality when thus scattered than they are upon the natural beds, and Ingersoll, in his "Report on the Oyster Industry of the United States," quotes the statement of Captain Cox, of New Jersey, that thirteen dollars' worth of small "seed" oysters yielded, after they had been planted for two years, oysters which were sold for $111, besides about thirty bushels which were used as food by the planter's family.

Oyster planting can be carried on only on private grounds, and it cannot flourish in a community which does not respect the right of the private owner to the oysters which he has planted.

The "five-acre law" of Maryland puts it within the power of any resident of the State to obtain land for this purpose, but the industry has never attained to much importance here, and partly on account of the absence of sufficient protection, and partly no doubt through the feeling that our large and apparently inexhaustible natural beds render private enterprise unnecessary.

In Virginia more attention has been given to planting, and in some of the States north of us all the land which is fit for the purpose is thus occupied. In many States, as in Delaware, a great part of New Jersey, and especially in Rhode Island, the natural beds have been so heavily drawn upon that they long ago ceased to furnish any marketable oysters, and they are now valuable only as a source from which a supply of small oysters can be gathered each year for planting. The spat from the few mature oysters which escape the fishermen, and that which drifts into the beds from the planting grounds and from the scattered oysters which still exist in protected places, keeps up the supply from year to year, and its value is increased hundreds of times by the planting system.

The industry does not require a large capital, and it can be carried on with profit on a very small scale, although the oysters need constant and intelligent attention. In all places where it has been employed it has added greatly to the prosperity of the communities which have engaged in it, and has greatly increased the population of the shores along which it has been encouraged and protected.

A writer about thirty years ago states that the prosperity and rapid increase of the population of Staten Island is chiefly due to the encouragement and growth of the oyster planting industry. At Prince's Bay, on this island, there has been some planting for more than sixty years, but before the bottom was laid out in private plantations there were very few persons living there, and the land was almost uncultivated; while in 1853 the number of inhabitants who depended directly upon this business for support had increased to over 3,000.

In some of the Northern States oyster planting has been in existence for many years. Ingersoll states that oysters have been planted in York Bay, in New Jersey, since 1810, and that a suit was brought in Shrewsbury, New Jersey, at about the same date, to determine whether a man has the exclusive right to the oysters which he has planted.

The history of the oyster industry of Rhode Island furnishes an interesting illustration of the value of an intelligent system of planting.

All bottoms between high-water mark and the ship channel are public property, to be controlled and administered by the State in such a way as to secure the greatest good to the greatest number of its citizens.

In 1865 laws were passed allowing the leasing to private citizens, for a term of years, at an annual rental of $10 per acre, of any bottoms which are covered with water at low tide and are not within any harbor line, to be used as a private oyster fishery for the planting and cultivation of oysters, whether these lands contain natural beds or not, and efficient laws were enacted for the protection of private rights.

The effect of this measure has been good in every respect. The revenue of the State has been greatly increased, and it is stated that the rentals of the beds will in time pay all the expenses of the State government.

The price of oysters has decreased, and the supply has become so abundant that only one-tenth are needed for the home market, and nine-tenths of the annual supply is sold outside the State.

In 1865 oysters sold for $1.75 per solid gallon; in 1878 the price was $1.15 to $1.10, and in 1879 it had fallen to 90@95 cents.

In 1865 the product of the State was 71,894 bushels, while in 1879 it was 660,500 bushels.

The area which was used for planting in 1879 was only 962 acres, yet this area paid $6,582.90 into the State Treasury; it employed a capital of over $1,000,000; it paid $125,000 in wages to the people of the State; it furnished the market with 660,500 bushels of oysters, with $680,500 to the producers, and it gave support to 2,400 persons.

The following table gives the revenue of the State from the rent of the beds for each year, from 1865, when the present method was adopted, up to 1878, and also in 1882 and in 1883:

1865	$ 737 32	1873	$ 4,483 88
1866	661 27	1874	4,997 05
1867	1,568 50	1875	5,276 00
1868	1,814 40	1876	5,300 00
1869	1,946 15	1877	6,045 25
1870	1,527 65	1878	6,582 90
1871	2,186 63	1882	9,741 00
1872	2,772 95	1883	11,000 00

Until within the last year the Rhode Island grounds have been used only for planting, and most of the seed oysters are purchased from other States, yet the planted oysters sell for three or four times the cost of the seed, and it is doubtful whether there is any farming land in the United States which yields as great a profit to the acre as the 1,100 acres which have been used this year for oyster planting in Rhode Island.

Our little revenue to the State Treasury of about fifty thousand dollars from nearly a million acres, sinks into insignificance when compared with the eleven thousand dollars which Rhode Island receives from her eleven hundred acres, and her beds are constantly improving in value, while ours are rapidly becoming worthless under our present policy.

In the early days of Rhode Island oysters were found there in the greatest abundance, but although dredging was forbidden in 1766, under penalty of ten pounds fine, the natural beds have been so depleted

by excessive tonging that they are now of little value, and they supply only a very small part, less than one-eighth, of the seed used in planting.

The only place in the State where seed oysters can now be obtained in any considerable quantity is a little strip of about five miles in the Seekook River, where the oysters are not marketable on account of their vivid green color. As the oysters lose this color when transplanted for a few months they are used by the planters, and the bed yields from five to ten thousand bushels a year. With this exception most of the seed oysters are purchased outside the State.

A synopsis of the laws by which this industry is regulated and protected in Rhode Island is given on a later page of this report.

We have, in another place, given figures to show that if all the area of our own State which is proper for oyster planting were used in this way, it would, if no more profitable than the oyster grounds of Rhode Island, bring the inconceivable sum of two thousand million dollars into the hands of the planters each year.

VALUE OF PLANTING.

The oyster industry of Delaware furnishes an instructive illustration of the value of oyster planting. The natural beds of this State are not equal to a two-hundredth part of those of our State, but under a law which allows any citizen to appropriate fifteen acres of ground where there are no natural oysters, upon payment of a fee of $25, and an annual license fee of $3 per ton for the boat used, a system of planting has grown up which is encouraged by public sentiment and is a great source of wealth.

Nearly half of the million bushels of seed oysters which are planted annually upon these beds are taken from our waters, and they cost the planter less than twenty-five cents per bushel, put down upon his beds. These oysters are taken up within three or four months, and are then sold for more than eighty cents per bushel.

As the boats which gather these oysters are required to be owned in Maryland and to pay a State license fee, the sale of seed oysters for twenty-five cents a bushel outside the State is not illegal, but it is surely unnecessary to point out that, so long as there are unoccupied planting grounds within our own waters, this is equivalent to the loss of fifty-five cents per bushel, or over $250,000 a year. The true remedy, however, is not to prohibit this exportation, but to encourage in all possible ways a planting industry in our own waters, and thus to bring this added value into the pockets of our own planters. As long as there is no one in Maryland to use these 488,000 bushels of seed oysters, it is for the public interest that the people of Delaware should be allowed to buy them, and make them worth eighty cents instead of twenty-five cents, but it is to be hoped that our own people will, before long, appreciate and seize upon this great opportunity for an almost unlimited investment of industry and capital.

FRENCH CLAIRES OR FATTENING PONDS.

A method of oyster planting in artificial ponds has been highly developed in France, where it is found to yield an adequate return for the labor and capital invested, as oysters fattened in this way sell for fifty per cent. more than those from the natural beds. The method involves considerable labor, and it is doubtful whether the price of oysters in this country is as yet high enough to render this industry profitable; but as our State contains thousands of acres of land which is at present of no value whatever, while it is perfectly adapted for the construction of oyster ponds, we shall give such an account of the French ponds as will enable anyone to experiment in this direction. As our winter climate is much more severe than that of the French coast, and the rise and fall of the tide very slight, some changes in the arrangements of the ponds will be necessary, but there is no reason why the same general plan should not be followed here to great advantage as soon as the price of oysters increases sufficiently to warrant the labor. We are indebted to a recent French work upon the oyster (Guide Practique de L'Ostréi-

culture et Procédés d'Elevage et de Multiplication des Races Marines Comestibles, par M. Felix Fraiche) for the following facts regarding the construction and management of artificial oyster ponds or claires.

"ARTIFICIAL BASINS."

"*Claires, live-ponds, parks*, &c.—For a long time past the breeders of Mareennes, at the mouth of the Seudre, have employed, for fattening and perfecting oysters, artificial basins called *claires*, a description of which we now propose to give. Recommended by long experience, they seem to us, save for the necessary improvements which we shall mention, the best model to follow in the construction of artificial breeding ponds. The claires are basins of variable form and extent, but generally with an area of about two to three hundred square meters (about the same number of square yards). Situated at a short distance from the sea, and with the waters they contain at a higher level than the mean height of ordinary tides, it is only at the period of the spring-tides, or at each new and full moon, that the sea rises to their level and supplies them anew with water. The best claires are those which receive water periodically from the sea, during about three days before and three days after each highest tide. This period of renewal for the claires is that which experience has found to be the best, and it determines the maximum altitude above the sea for the construction of these reservoirs."

"Around each claire is built a levee or dirt wall, called a *yard*, about one meter in height and thickness. This yard retains the water filling the basin, and upon it the workmen pass to and fro in inspecting and working the claire. A flood-gate closes a sluice in one side of the wall, by means of which the sea water is admitted to the basin. This gate also regulates the height of the water within the basin, and if desired, the basin can be entirely emptied by opening it wide. All around the inner circumference of the yard a continuous trench is dug to receive the mud deposited in the basin from the stagnant water, for if this mud should be left in the basin the oysters would soon be smothered. In order to facilitate the clearing away of the mud into this ditch a slight slope is given to the bottom of the basin, circumscribed by the ditch, from the centre towards the borders, so that the surface is sensibly convex. Some breeders dispense with this ditch; in which they are probably wrong, for if it does not prevent the deposit of mud, it at least retards it and lessens its effect. Its use cannot be judiciously dispensed with, unless the water has a long distance to run from the sea and is given a chance to settle before being admitted to the claire, so as to enable it to part with the greater share of the mud which it carries.

"In order to prepare the ground of the claire for the reception of oysters, it must first be cleared of stones and all vegetation which may cover it, then the necessary slope from the center towards the sides may be given it. The ditch is next dug and the yard thrown up. Then with the sluice-way made and the gate in place the claire is ready to be filled with water during the first high tide. When the basin is full the gate is closed and the water retained after the sea has returned to its ordinary level. The sea-water soon penetrates the soil of the claire, saturating it with salt, destroying all injurious germs, and transforming it, in a word, into a marine bottom. As soon as it is supposed that this effect is produced, the gate is opened and the surface paved; that is, it is first smoothed over, and then pounded until it has the even, compact appearance of a threshing-floor. In about two months the bottom of the claire will be ready for the reception of the oyster. The breeders, to supply these claires, have, up to the present time, had recourse to oysters taken directly from the sea, either from banks near at hand or along the coasts of Brittany, and brought in bulk in coasting vessels. In order that the products should be of a good quality and that the regimen of the claire should have a beneficial influence upon the oysters contained therein, it is necessary that they should not be older than from fifteen to eighteen months, or larger than from five to seven centimeters in diameter (about two inches). The breeder culls them, cleans them, chooses the best shaped ones, and then scatters them with a shovel over the surface of the basin. Afterwards they are all arranged by hand so that nothing shall hinder their development or interfere with the opening of their valves. In this manner about 150,000 can be accommodated upon a hectare (about 2.41 acres)

of surface. The claire is then filled with water, which is maintained at a uniform depth of 30 to 35 centimeters. This water, as has already been said, is renewed only at the spring-tides, and at this time the water in the claires is necessarily very much raised in level, and consequently the most active supervision is necessary, for the heavy pressure upon the dikes may produce breaks or fissures which it is necessary to repair immediately or widespread disaster may result. During cold or hot weather or sudden changes of temperature, the breeders maintain the water in the claires at a higher level than the ordinary, in order to obviate the destructive action of the frost in winter or the rapid evaporation and heating of the water in summer. Nevertheless, the construction of the claire does not always permit of accident from these causes being guarded against, and sometimes the result is an enormous mortality and the ruin of the breeders. Moreover, the water by remaining in the same basin necessarily deposits there a certain amount of sediment which continually accumulates, being added to at each high tide, and especially during the equinoctial tides, thus placing the oysters in no slight danger. To remedy this evil, since it is impossible to prevent the deposit of mud, the breeders always have certain unoccupied claires into which they transfer the oysters from the muddy claires while these are being cleaned. After a thorough cleansing they are left empty until it becomes necessary to clean the other claires, when the oysters are transferred back to their old quarters. But certain of the breeders, not willing to allow portions of their land to lie unproductive, content themselves by cleaning the bottoms and then replacing the oysters in their old inclosure, always soiled with mud. It is useless to enumerate the defects of this practice, which can only produce inferior results, both as to quality and numbers."

"Such, in a few words, is the industry of the breeders of Marennes, and it is this which we shall take as a guide, if not as a model, for debarring certain imperfections, it presents the most rational and best combined principles. If the breeders were in the habit of obtaining the germs necessary to restock their claires from the claires themselves, if they had constructed their ponds so as to be able to raise the level of the water contained in them from one and one-half to two meters, and had subjected the water from each tide to a certain amount of stagnation before entering the claires, so that it would carry with it as little mud as possible, there would be nothing lacking in their methods; it would simply be necessary to copy them. Let us profit, then, by all that is valuable in their industry, such as it is; let us borrow from the claires all that can be borrowed, all that long experience has proved efficacious, and then add the improvements suggested by our recent studies, and with these elements combined we shall have an excellent guide for the future service of breeders in constructing and working their claires and live-ponds."

"A claire or live-pond can be established upon any ground where the altitude above the level of the sea is sufficient to enable it to be covered by the tide, not every day, which would expose it to a too frequent deposit of mud, but at least twice per month, and during five or six days each time. And as a breeder should never be content with one claire, however small his establishment may be, a series of basins can be made, either in one or two rows, parallel to the coast, along the surface sloping to the sea, and all having the same level. It would not be prudent, however, to have so many that it would be necessary to place them at different levels, or in the form of steps, since in this case the lower ones would receive water more frequently, and even be submerged and exposed to a more frequent deposition of mud, while the upper ones would receive very little water. But if it becomes necessary to construct claires in a series of steps at different levels, either because of a restricted amount of surface or to utilize preexisting basins, they ought never to be used indifferently for oysters of all ages, because the conditions offered by the upper basins would be much more favorable for young oysters, and only when they have attained a certain size and a greater degree of vitality should they be placed in the lower apartments."

"The soil of the bottom of the claire demands, according to its nature, different kinds of treatment. If it is argillaceous or muddy, it should be cleaned and leveled, leaving the central portion higher than the borders, then pounded to give it solidity, and finally covered with water until the bottom is thoroughly saturated, when the water can be allowed to run out, and the bottom once more pounded

while it is drying. If the bottom is sandy it is necessary to render it impermeable, so that the water may not leak out, and also to consolidate it. To accomplish this the ground is worked over and covered with a layer of coarse gravel or fragments of shells, upon which is laid a layer of clay 30 to 40 centimeters (10 to 12 inches) in thickness, which is then treated as already mentioned for the marly bottoms. A bed of concrete answers the same purpose, and while it is more costly it is more durable. A pavement of blocks of sandstone or porphyry, &c., similar to those which are used in the pavements of certain of our cities, carefully pointed with clay or hydraulic cement, will thus make an excellent bottom. But the clays, especially the reddish clays and the bluish marls, should be preferred in all cases where one wishes the oysters to possess the greenish tint to which the oysters of Marennes owe their celebrity. Surrounding the ground thus prepared, are built the dikes which are to retain the water in the basins. These should be at least 2 metres in height above the bottom, so that a depth of water of from 1.50 to 1.80 metres can be maintained over the oysters, not all the time, as generally a depth of from .35 to .50 of a metre is best, but when it is very cold to prevent the injurious effects of frosts, and when it is very warm to prevent the water becoming too salt from evaporation. These dikes should be constructed very solid, so as to resist the great pressure which is brought to bear upon them at every spring-tide, and should also be covered upon the inside the same as the bottom, with a layer of clay or hydraulic cement, so as to prevent all leakage, which is very disastrous in these basins, since the water is renewed only at long intervals. Since these earthen dikes are liable to be injured, making it necessary to go to the expense of frequent repairs, it would be best, in my opinion, to construct them at first in masonry of rough stones and cement, and give them solid foundations. The upper portion of the larger of these dikes should be sufficiently broad and firm to permit the workmen to traverse them easily and without danger, for all the necessary manipulations of working and inspection. If the height of the ground permits, these claires can be formed by excavating in the solid earth, in which case it will only be necessary to cover the slopes of the banks with a layer of stones set in cement. This system moreover will allow of the utilization of lands slightly above the level of the tides, so that by uniting the two systems one can arrange three or even more rows of claires all upon the same level."

"As to the expense of construction, I judge it will be about the same for the two methods, the excavation in the one compensating for the masonry in the other. Finally, to avoid or at least retard the deposit of mud, resulting from the stagnation of the water, the claire should not receive a new supply of water from the sea without giving it a chance to deposit the greater part of its sediment, which can be accomplished by keeping it for a certain length of time in a special basin. These basins themselves might be made of service by providing them with gates and sluices, and using them as breeding or fattening ponds for mussels or other marine animals. Plate V, figs. 1 and 2, give a bird's-eye view and also a cross-section of two rows of claires, with their feeding and purifying basins. The following explanations will sufficiently explain all the details given. C, C′ represents two claires seen in section, the one dug into the bank, the other on the same level but nearer the open water. The sides or slopes of the former, B, B, consist of a layer of rough stones cemented together; the sides B′, B′ of the second are formed of thick walls, about two metres in height above the bottom of the claire, and about 1.40 metres in thickness at the bottom and .75 to .80 of a metre at the top, with an equal slope upon either side, *f*, *f*, of the bottom of each claire, the centre being higher than the sides by about .30 of a metre."

"V, V, sluices and gates for the entrance of water from the sea."

"V′, sluice and gate between two of the claires, to allow the entrance of water into one, only after remaining a certain time in the other, and to establish the same levels in both compartments."

"S, basin for the deposit of the sediment contained in the sea-water, which enters through the gate V″. It can also be used, if desired, as a supply reservoir, for the claires during the intervals between the spring tides. In this case it should be constructed in the same manner as the claires themselves, so as to retain the water stored in it. Otherwise it will only be necessary to make the dikes of dirt. In any case, it ought to be proportioned in size and capacity to the claires which it supplies."

"T, T', canal through which the water enters from the sea."

"By the aid of the sluice-ways and gates in this canal the water can be admitted directly into the claires without entering the outer basin at all. This could be done in case the outer basin were utilized for the rearing of mussels and there was danger of the spawn of the mussels entering into the claires at the period of reproduction."

"METHODS OF WORKING THE CLAIRES."

"Now that enough has been said in relation to the apparatus for collecting the young growth, and the construction of the breeding-ponds, there remain only a few words to be said concerning the method to be followed in commencing and continuing a profitable artificial oyster culture. First, it is necessary to construct the breeding-ponds which, for the sake of greater precision, we call *claires*, taking as a basis for their extent the proportion of 1,000,000 oysters to the hectare or 100 per square metre, a proportion which, if is desired simply to raise oysters, can be carried to 500 or 600 per square metre, or 5 to 6 millions per hectare; this is the proportion in the parks of the island of Re. During their construction, and in order to stock them as soon as they are completed, the young growth is procured by means of the collecting apparatus already described, or by some of the other forms, preference being given to that which will answer best for transportation, &c., according to the distance traversed from the spawning locality to the breeding-pond. As six months of time at least must elapse after the young growth have become attached to the collectors before they can be transported with safety, the two operations, of constructing claires and gathering the young, ought to proceed simultaneously. It is in June that this work should be undertaken in the ocean, and a little earlier in the Mediterranean. When the claires are finished, and have a layer of pure and fresh sea-water over the bottom, the oysters which have been brought upon the collectors should be distributed as evenly as possible with a shovel, and afterwards arranged by hand, so that they may not form piles in certain places, and be entirely wanting over other sections. As the oysters should not remain in the same basin during the entire period of their growth, and as the young detached from the collectors are very small, they can be easily so arranged that three or four hundred can be accommodated upon a square metre of service, and afterwards, as they increase in size, they can be separated, so as to give more room to each. The time of this labor should be chosen so as to end, if possible, at the period of a spring-tide, in order that the young oysters, placed upon strange soil and in strange water, may be promptly refreshed by the incoming tide, and covered with a layer of water sufficiently deep to prevent any abrupt change of temperature. During the entire first year it will be well if the water never has a less depth than about one metre, and a strict guard will be necessary to maintain the dikes in good condition, repair all breaks, look out for the deposit of mud, and if any takes place change the oysters to another claire without delay. Later, in proportion as the oysters increase in size, and are less affected by external changes, this constant oversight can be relaxed to a certain extent, but not entirely, and the level of the water may be lowered to from .50 to .30 of a metre, always taking care, however, to increase the depth to 1.50 to 2 metres during very cold or very warm weather. It will be readily understood with how much caution the level of these basins should be lowered, when it is remembered that it is only possible to fill them again at quite long intervals, eight to ten days generally, during which time, especially in spring and autumn, great changes of temperature may take place, exposing the oyster to evils against which there is no remedy. For young oysters, and especially during their first year's growth, the most formidable enemy is mud. We have already spoken of transferring the oysters from a basin where the mud has accumulated or is being rapidly deposited to another which is free from mud, but this measure, which is excellent for oysters somewhat advanced in size, is not always satisfactory for the very young individuals; and besides, at certain seasons of the year the temperature would render such a change impracticable. I would counsel the breeders then to use for the first year frames of galvanized iron, about two square metres in superficial area, covered with a netting of galvanized iron or zinc wire, having meshes

of such a size that the young oysters could not fall through. These frames could be supported upon four or eight legs from .20 to .30 of a metre in length, and arranged side by side in rows over the bottom of the claires, thus forming a double bottom with a space between the frames and the soil sufficient to accommodate the mud, which would then never trouble the oysters upon the frames. They could be left in this position the entire year, without disturbing them. After this time they should have sufficient natural vitality to be handled without danger, and could be placed upon the bottom of a fresh claire. Thus in the rearing of oysters, since five years are required for an oyster to become of marketable size, it will be necessary to allot five claires to the rearing of one generation, and to establish a series which shall render the production continuous. One claire in five should, therefore, be provided with the wire tables mentioned above. The necessary expense of their construction and introduction would be compensated by the decreased cost of manipulation and attention, and the greater production from the claires. The employment of these frames would be nearly indispensable for basins along the shores of the Mediterranean, which, nearly always covered by the sea, are more liable than others to be covered by a deposit of mud, which can be cleared away only at considerable expense."

"During the first three or four years of such an enterprise one should, in order to procure the young growth necessary to restock the claires left vacant by the preceding generation, have recourse, as at first, to the movable collectors, and bring the young from some natural bank; but as soon as a generation of oysters becomes adult, and consequently capable of reproducing the species, the claires themselves ought to produce all the young necessary to furnish the ponds with a constant supply of animals. To accomplish this, about one month before the spawning season collectors are disposed in those claires containing the adult oysters, it having first been ascertained that these oysters are nearly ripe. The collectors are chosen at the convenience of the breeder, according to the means and resources of the country where the claires are situated, and become charged with young just the same as over the natural beds at sea, since before being taken from the ponds for market the adult oysters leave there a numerous progeny to replace themselves; as the germs produced are always vastly more numerous than the oysters which produce them, if the breeder does not desire to extend his industry and increase the number of ponds, collectors need be placed only in one or more of the ponds containing adults, so that the demands of commerce can always be satisfied during the five or six months required to charge the collectors. Experience proves the efficacy of this process. Many times, despite the defective condition of their claires, the breeders of Marennes have witnessed their basins, depleted by a wide-spread mortality, unexpectedly repeopled from a few oysters which had survived the disaster, the young developing upon the shells of the dead oysters. The shells in these cases acted as collectors to retain the germs which otherwise would have perished or been carried off by the first spring-tide."

"It is perhaps to be wondered at, and even regretted, that such facts should not have caused the breeders to see the immense advantange of making their basins places of production and growth as well as fattening establishments. To-day, thanks to the light thrown upon this question by the researches of M. Coste, the oyster industry can be raised above the condition in which it has been kept up to the present time, by routine and indifference, and spread along our coasts, which have been threatened with misery and depopulation. The consequences will be an eminently remunerative industry and a permanent source of labor, which will attract to our coasts numerous and robust men, the future hopes of our naval and commercial marine. A few figures, not chosen by chance, but selected as a possible minimum, may serve to prove to my readers that I have not exaggerated in qualifying the new industry as highly remunerative, especially when it is called to mind that the lands upon which this industry is carried on are nearly valueless, and unsuited to any other sort of cultivation."

"The price of a hundred oysters of the Marennes variety varies from 1½ to 6 francs. Let us then adopt the price of 3 francs, which is less than a mean, as the average price per hundred. Upon a square metre of surface in a claire we can raise from 60 to 80 oysters, and if we take the minimum at 50 it will give us, upon a hectare of surface, or about 2½ acres, 500,000 oysters, which in about five years (average

time of growth) would be worth at 3 francs per hundred, the sum of at least 15,000 francs, making a yearly revenue of 3,000 francs or $600. In 1863, on the island of Re, a sailor named Moreau sold the first gathering from his park, which contained only 500 square metres, for 1,300 francs, making the revenue 26,000 francs per hectare, or $2,180 per acre. Admitting what is evidently above the truth, that the expense of labor, repairs, supervision, &c., absorbs three-fifths of this revenue, then the net profits would be 1,200 francs per hectare, or for the five years 6,000 francs or $1,200. But these calculations are based, as will be recognized, upon mean numbers, which are probably lower than facts would demand. It will readily be seen, then, that in five years a landed property of the value of at least 6,000 francs, or $1,200 a hectare, or 2½ acres per year, can be established upon lands which before were unproductive and of no value. I think it can be said, without danger of exaggeration, that there are few, if any, rural occupations which in so short a time will give equal results."

"As to the decrease in price of oysters, consequent upon the increased production of this mollusk, there is nothing to fear at present. Thanks to steam, the oyster can cross our entire continent without becoming dry on the way. Our coasts are called upon to answer the demands not only of all France, but of other countries. The demands for a long period have been greater than the supply, and we are too far as yet from the time when the supply shall equal the demand to include this among the risks."

In order to encourage experiments in this direction in our waters, we recommend the passage of a law which shall give to any one who constructs ponds upon any lands of which he is the lawful occupant the exclusive right to all oysters in the pond.

In the chapter on oyster farming we show that these artificial ponds can be used for breeding oysters, and can thus be made to supply seed for planting independently of the natural beds.

The various extracts and illustrations which we have given are surely enough to show to everyone the advantage which would accrue to our people if a thorough system of oyster planting could be introduced among us, and yet so little is this understood that the answer to the question—"What can be done to encourage the planting interest?" in the printed list of questions which has been distributed among the oystermen by the commission, was, in every case where any answer was given to this question, that this interest is already sufficiently provided for, and does not need any encouragement.

As long as this ignorance of the subject exists little can be done, and while it is easy to perceive that the marshy and almost uninhabited shores of our tidewater creeks and inlets are among the most valuable lands in the State, and that they will sometime support a numerous and prosperous population of oyster planters, it is of course impossible to hasten this by legislation in the absence of a desire to improve the opportunity.

While legislation alone cannot develop a planting industry in our waters, it can do much to prepare for it, so that there shall be no unnecessary obstacles to hinder any one from opening the way.

Your commissioners have carefully studied the laws of Maryland relating to planting, as well as the laws of the States where a planting interest has been developed, and they have thus been led to recommend a number of changes in the existing law.

The most serious obstacle is the absence of efficient protection for planted oysters, as they are exposed to the depredations of both dredgers and tongmen. If private planting grounds could be protected from the dredgers, most of this difficulty would be removed, for the tongmen can be reached by the local authorities, who will have no difficulty in keeping them under control so soon as public sentiment is in favor of so doing.

The restraint of the dredgers within lawful bounds is a more difficult matter. To secure this we recommend in the first place that the boundaries of the grounds open to dredgers be made straight lines between prominent head-lands, so that the oyster police shall be able to decide at a distance whether a dredging boat is at work on lawful ground or not. We recommend, in the second place, that the area which is open to dredgers be divided into districts small enough for one police steamer to thoroughly and constantly guard all the boundaries, and we also recommend that a sufficient number of steamers be built to supply one for each of these districts.

These measures, which are fully set forth in another part of this report, will, as we believe, thoroughly protect planted oysters from depredations by dredgers.

We also recommend that several important changes be made in the law known as the "five-acre law," under which any resident of the State is allowed to appropriate five acres of bottom for oyster planting.

At present no natural oyster bed can be thus appropriated, and any bottom to which the public have been in the habit of resorting for oysters is a "natural bed." As oysters are found in all of our waters except the muddy bottoms of the channels, it is doubtful whether there is any place in the State which is fit for planting where some one cannot truthfully affirm that he has at some time gathered natural oysters, and as the "natural beds" have never been surveyed or designated by law, this provision of the law exposes all planting grounds to the depredations of oystermen. In view of the fact that the natural beds are rapidly losing their value, and that a law which allows any resident to cultivate and preserve and improve five acres of this ground does not give to one person any right which is denied to others, we recommend that the five acre law be so changed as to allow any resident to appropriate five acres in any bottom which is not already appropriated.

At present the holders of grounds under this law pay nothing for the right, and they do not hold it on any secure tenure, since the Legislature may at any time repeal the law. As we believe that there would be a much greater incentive to the investment of labor and capital in oyster planting, if the planting grounds were made as much like real estate as possible, we recommend that the State give to each person, who holds land under this law, a lease, which shall make it his forever, and which shall subject it to all the laws governing real estate; and we also recommend that in order to obtain this lease, the applicant be required to purchase the land from the State at $1.00 per acre; and that any persons, who now hold land under the "five-acre law" be given a year to pay this price and obtain leases.

The present law permits the sale of planting grounds, but no person can hold more than five acres. We believe that this artificial limitation is disadvantageous, and that the owner of an oyster-planting ground should be allowed to sell them as freely as he can sell his lands above water, and that a person who already holds five acres should be permitted to buy or to inherit any other ground which has been lawfully leased from the State; but while we believe that the five-acre limitation is disadvantageous, we do not recommend its repeal at present, as it is a matter which can safely be left to future consideration.

In some of the States where grounds are held for private planting they are taxed like real estate, and the propriety of this measure cannot be questioned, as the holder of a valuable franchise should surely pay for protection in the enjoyment of his rights. We believe, however, that the fostering of the planting industry is of more importance than an immediate revenue to the State, and we therefore make no recommendation regarding the taxation of private oyster ground, although we wish to call attention to the propriety and importance of such action in the future.

CHAPTER VII.

Oyster Farming.

DESCRIPTION OF A NATURAL BED.

An examination of a Coast Survey chart of any part of the Chesapeake Bay or of any of its tributaries will show that there is usually a mid-channel or line of deep water, where the bottom is generally soft and where no oysters are met with, and on each side of this, an area where the bottom is hard, running from the edge of the channel to the shore. This hard strip is the oyster area. It varies in width from a few yards to several miles, and the depth of water varies upon it from a few feet to five or six fathoms, or even more. But there is usually a sudden fall at the edge of the channel where the oysters stop, and we pass onto hard bottom; and a cross-section of the channel would show a hard, flat plane, with oysters, on each side of the deep, muddy channel. The oyster bottom is pretty continuous, except opposite the mouth of a tributary, where it is cut across by a deep, muddy channel. The solid oyster rocks are usually situated along the outer edge of this plateau, although in many cases they are found over its whole width nearly up to low-tide mark, or beyond. As we pass south along the bays and sounds of Virginia and North Carolina, we find that the hard borders of the channel come nearer and nearer to the surface, until in the lower part of North Carolina there is on each side of the channel a wide strip of hard bottom, which is bare at low tide and covered with oysters up to high-water mark, although the oysters are most abundant and largest at the edge of the deep water, where they form a well-defined reef. In our own waters there is usually a strip along the shore where no oysters are found, as the depth of water is not great enough to protect them in winter. The whole of the hard belt is not uniformly covered with oysters, but it is divided up into separate oyster rocks, between which comparatively few can be found.

The boundaries of a natural rock which has not been changed by dredging, are usually well defined, and few oysters are to be found beyond its limits. The oysters are crowded together so closely that they cannot lie flat but grow vertically upwards, side by side. They are long and narrow, are fastened together in clusters, and are known as "coon oysters."

When such a bed is carefully examined it will be found that most of the rock is made up of empty shells, and a little examination will show that the crowding is so great that the growth of one oyster prevents adjacent ones from opening their shells, and thus crowds them out and exterminates them. Examination shows, too, that nearly every one of the living oysters is fastened to the open or free end of a dead shell which has thus been crowded to death, and it is not at all unusual to find a pile of five or six shells thus united, showing that number two had fastened, when small, to the open end of number one, thus raising itself a little above the crowd. After number one was killed number two continued to grow, and number three fastened itself to its shell, and so on. Usually the oysters upon such a bed are small, but in some places shells twelve or fourteen inches long are met with. The most significant characteristic of a bed of this kind is the sharpness of its boundaries. In regions where the oysters are never disturbed by man it is not unusual to find a hard bottom extending along the edge of the shore for miles and divided up into a number of oyster rocks, where the oysters are so thick that most of them are crowded out and die long before they are full-grown, and between these beds are areas where not a single oyster can be found. The intervening area is perfectly adapted for

the oyster, and when a few bushels of shells are scattered upon it they are soon covered with young, and in a year or two a new oyster rock is established upon them, but when they are left to themselves the rocks remain sharply defined. What is the reason for this sharp limitation of a natural bed? Those who know the oyster only in its adult condition may believe that it is due to the absence of powers of locomotion and may hold that the young oysters grew up among the old ones, just as young oak trees grow up where the acorns fall from the branches. This cannot be the true explanation, for the young oysters are swimming animals, and they are discharged into the water in countless numbers, to be swept away to great distances by the currents. As they are too small to be seen at this time without a microscope it is impossible to trace their wanderings directly, but it is possible to show indirectly that they are carried to great distances, and that the water for miles around the natural bed is full of them. They serve as food for other marine animals, and when the contents of the stomachs of these animals are carefully examined with a microscope the shells of the little oysters are often found in abundance. While examining the contents of the stomach of lingula in this way I have found hundreds of the shells of the young oysters in the swimming stage of growth, although the specimens of lingula were captured several miles from the nearest oyster bed. As lingula is a fixed animal the oysters must have been brought to the spot where the specimens were found, and as lingula has no means of capturing its food, and subsists upon what is swept within its reach by the water, the presence of so many inside its stomach shows that the water must have contained great numbers of them.

It is clear then that the sharp limitation of the area of a natural oyster bed is not due to the absence in the young of the power to reach distant points. There is another proof of this, which is familiar to all oystermen—the possibility of establishing new beds without transplanting any oysters. The following illustration of this was observed by one of your commissioners. On part of a large mud flat which was bare at low tide there were no oysters, although there was a natural bed upon the same flats, about half a mile away.

A wharf was built from high tide mark across the flat out to the edge of the channel, and the shells of all the oysters which were consumed in the house were thrown onto the mud alongside the wharf.

In the third summer the flat in the vicinity of the wharf had become converted into an oyster bed, with a few medium-sized oysters and very great numbers of young, and the bottom, which had been rather soft, had become quite hard; in fact, the spot presented all the characteristics of a natural bed.

Changes of this sort are a matter of familiar experience, and it is plain that something else besides the absence in the oyster of locomotive power determines the size and position of a bed.

Now what is this *something else?*

If the planting of dead shells will build up a new bed, may we not conclude that a natural bed tends to retain its position and size because the shells are there?

This conclusion may not seem to be very important, but I hope to show that it is really of fundamental importance and is essential to a correct conception of the oyster problem.

Why should the presence of shells, which are dead and have no power to multiply, have anything to do with the perpetuation of a bed?

We have already called attention to the fact that oysters are found on the hard bottom on each side of the channel, while they are not found in the soft mud of the channel itself, and it may at first seem as if there were some direct connection between a hard bottom and the presence of oysters, but the fact that no oysters are found upon the hard, firm sand of the ocean beach, shows that this is not the case. As a matter of fact, they thrive best upon a soft bottom. They feed upon the floating organic matter which is brought to them by the water, and this food is most abundant where the water

flows in a strong current over soft organic mud. When the bottom is hard there is little food, and this little is not favorably placed for diffusion by the water, while the water which flows over soft mud is rich in food.

The young oysters which settle upon or near a soft bottom are therefore most favorably placed for procuring food, but the young oyster is very small—so small that a layer of mud as deep as the thickness of a sheet of paper would smother and destroy it.

Hence the young oysters have the habit of fastening themselves to solid bodies, such as shells, rocks or piles, or floating bushes, and they are enabled to profit by the soft bottoms without danger.

Owing to the peculiar shape of an oyster shell, some portions usally project above the mud long after most of it is buried, and its rough surface furnishes an excellent basis for attachment. It forms one of the very best supports for the young, and a little swimming oyster is especially fortunate if it finds a clean shell to adhere to when it is ready to settle down for life. Then, too, the decaying and crumbling shells are gradually dissolved in the sea water, and thus furnish the lime which the growing oyster needs to build up its own shell. As long as the shell is soft and thin the danger from enemies is very great, and this danger is greatly diminished as soon as the shell becomes thick enough to resist attack. It is, therefore, very necessary that the shell should be built up as rapidly as possible, and an abundant supply of food in general will be of no advantage, unless the supply of lime is great enough for the growth of the shell to keep pace with the growth of the body. All sea water contains lime in solution, but the percentage is, of course, greatest near the sources of supply. It is well known that on coral reefs, which are entirely made of lime, all kinds of shelled molluses flourish in unusual abundance, and have very strong and massive shells; and our common land and fresh-water snails are much larger and more abundant in a limestone region than in one where the supply of lime is scanty. In such regions it is not unusual to find the snails gathered around old decaying bones, to which they have been drawn in order to obtain a supply of lime for their shells.

From all these causes combined it results that a young oyster which settles upon a natural oyster bed has a much better chance of survival than one which settles anywhere else, and a natural bed thus tends to perpetuate itself and to persist as a definite, well-defined area; but there is still another reason. As the flood-tide rushes up the channels it stirs up the fine mud which has been deposited in the deep water. The mud is swept up onto the shallows along the shore, and if these are level much of the sediment settles there. If, however, the flat is covered by groups of oysters, the ebbing tide does not flow off in an even sheet, but is broken up into thousands of small channels, through which the sediment flows down, to be swept out to sea.

The oyster bed thus tends to keep itself clean, and for these various reasons it follows that the more firmly established an oyster bed is the better is its chance of perpetuation, since the young spat finds more favorable conditions where there are oysters, or at least shells, already, than it finds anywhere else.

Now, what is the practical importance of this description of a natural bed?

It is this: Since a natural bed tends to remain permanent, because of the presence of oyster shells, the shelling of bottoms where there are no oysters furnishes us with a means of establishing new beds or of increasing the area of the old ones.

The oyster dredgers state, with perfect truth, that by breaking up the crowded clusters of oysters and by scattering the shells, the use of the dredge tends to enlarge the oyster beds. The sketch which we have just given shows the truth of this claim, but this is a very rough and crude way of accomplishing this end, and we shall devote the rest of this chapter to a description of the means which have been employed, in different places, to accomplish the same result more efficiently and methodically.

EXPLANATION OF PLATE V.

FIGURE 1.—Cross-section; and

FIGURE 2.—Bird's-eye view of two rows of artificial ponds for rearing and fattening oysters; from "Fraiche's Guide Practique de L'Ostrèiculteur." Two of the ponds are shown in sections at C C′, the one dug into the bank and the other on the same level but nearer the open water. The sides or slopes of the former, B B, consist of a facing of rough stones, cemented together; while the sides of the latter, B′ B′, are thick stone walls. V V, Sluices and gates for the admission of water from the sea. V′, Sluices and gate between two of the ponds, to allow the entrance of water into one, only after it has remained for a certain time in the other, or to establish the same level in both. S, Basin for the deposition of the sediment contained in the sea water which enters through the gate V″. It can also be used as a supply reservoir. T T, Canal through which the water enters from the sea

FIGURE 3 AND FIGURE 4.—Frames for supporting tile collectors.

FIGURE 5.—Bundle of tiles fastened to a stake for collecting spat upon muddy bottom.

FIGURE 6.—Pincers for cutting up the tiles in order to separate the oysters from each other, for planting.

(FIGURES 3, 4, 5 and 6 are from Hausser's Report on "L'Industrie Huitière dans le Morbihan.")

FIGURE 7.—Frames for use in the box collector shown in plate XIII.

(We are indebted to Prof. S. F. Baird, Superintendent U. S. Fish Commission, for the use of the figures in this plate.)

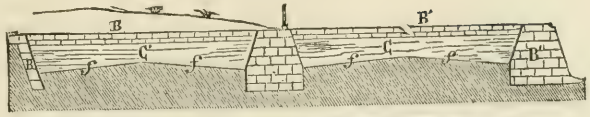


FIGURE 1

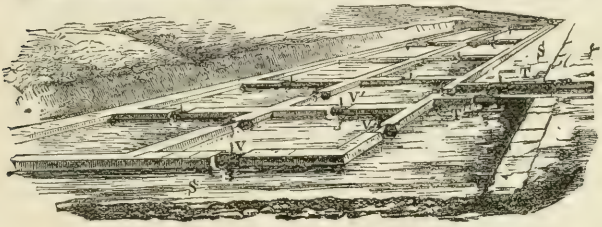


FIGURE 2.

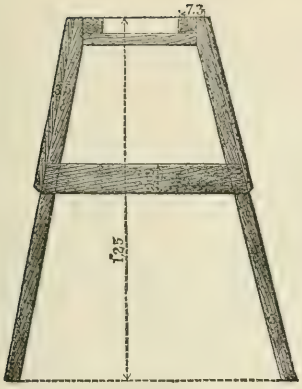


FIGURE 3.

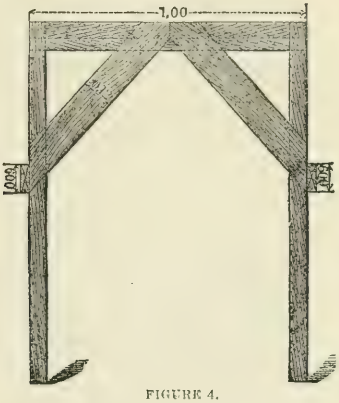


FIGURE 4.

FIGURE 5.

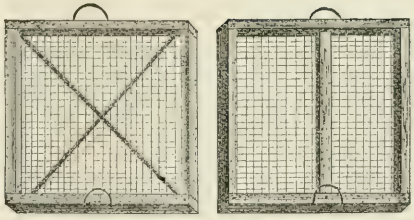


FIGURE 7.

FIGURE 6,

ON OYSTER FARMING.

Within recent years, much attention has been given to the possibility of increasing the supply of oysters by artificial means.

The oyster is well known to be enormously prolific, a single one giving birth, in one season, to many million young; and it is obvious that the annual supply would be enormously increased if all the young whisch are born could be reared to maturity.

Unfortunately this is not the case, and under a state of nature millions of oysters are born for each one which grows to maturity. Mobius has shown that in Europe each oyster which is born has only one chance in one million one hundred and forty-five thousand of reaching maturity; and one of your commissioners has shown that the chances of each American oyster are very much less.

One of the most important discoveries of the last fifty years is, that it is quite possible to save many of these oysters by artificial means; and experiments which have been carried on in France, as well as in many parts of our own country, prove that this can be done, successfully and economically, on a very large scale.

Soon after it is born the young oyster fastens itself to some solid body. It is at first so small that it is smothered and killed at once if it falls upon a muddy or slimy bottom, and its only chance for life is in the discovery of some perfectly clean, hard body upon which to fasten. Many young oysters are killed by accidents or enemies after they have fastened themselves, but by far the greater number perish through failure to find proper places for attachment; and the whole secret of oyster culture is to furnish proper bodies for the attachment of the young.

Many methods of doing this have been devised and employed; and the possibility of in this way increasing the area and value of the natural beds, and of building up new beds, or restoring old ones, has been proven.

As this is by far the most important aspect of the oyster problem, we shall devote considerable space to the history of these experiments, and to a description of the means and apparatus which have been employed for the purpose.

Although the development of this industry on a large scale is quite modern, seed oysters for planting have been raised upon a small scale in Italy for more than a thousand years, by a method which is thus described by a recent French writer, (Guide Pratique de L'Ostréiculteur, par M. Felix Fraiche, translated by H. J. Rice for the Report of the United States Fish Commission for 1880.)

"About the beginning of the seventh century a Roman knight, Sergius Orata, undertook the artificial breeding of oysters in the waters of Lake Lucrin, the Avern of poets. Historical documents prove incontestably the existence of this establishment of oyster culture, and Pliny informs us that the enterprise was very successful, and its author in a short time became very rich. The methods followed, and probably invented, by Orata have been perpetuated to our day upon the banks of Lake Fusaro, a small salt-water lake, about a league in circumference, situated in the neighborhood of Cape Misene, near the ruins of Cumes, which has been poetized by Virgil under the name of Acheron. Upon the blackish mud, which covers the volcanic soil of this basin to a depth of from one to two meters, the fishermen have constructed here and there artificial rockeries formed of rough stones gathered together and thrown into heaps sufficiently elevated to be protected from deposits of mud or slime. Upon these rocks oysters taken from the sea were deposited, to form an artificial planting ground for all time, except, as is well understood, in the case of accidental mortality, such as has been occasioned by volcanic eruptions, which have sometimes necessitated their renewal. Each rockery is surrounded by a circle of stakes, which are fastened in the bottom of the lake by one end, while the other extends up out of the water so that they can be seen and removed when necessary. Often these stakes are united by a cord passing from one to another, and to which is suspended, between each two stakes, a small bundle of twigs, floating in the water a short distance from the

bottom. These, together with boats, tools, and a storehouse, constitute the entire apparatus used for oyster culture at Fusaro, and such is the apparatus which common experience has found to be invariably efficacious. At the spawning season the oysters deposited upon the artificially formed rockeries, and living there as if in the open sea, allow the myriads of germs to which each gives birth to escape, as an animated cloud of dust-like particles, which, finding close at hand suitable materials for their attachment, become located there almost as a mass, beside the mother oysters. An insignificant portion only of these young oysters are lost, either by being carried away by the current of the water, or by being buried in the mud of the bottom. The colony is thus continually increasing in size by the annual deposit of new germs, which develop under favorable conditions of shelter, light, and temperature. When the fishing season arrives the owners or leasers of these artificial banks take up the stakes and bundles of fagots, select without any trouble from among the oysters which cover them those of a suitable size for the market, and then replace the stakes, &c.; the remaining oysters continue their growth, and the vacant places become filled another season with a new lot. The industry at Lake Fusaro, which has prospered for centuries, employs, as can be readily seen, only methods of great simplicity—probably the same as were used by Sergius Orata—and it teaches for our benefit, that by careful and skillful management, aided by suitable means of collecting the spawn of the oyster, all of which is neither difficult nor expensive, one can indefinitely multiply this bivalve, while the processes employed by us at present lead only to the ruin of our naturally excellent beds."

The oyster farms of Lake Fusaro are shown in Plate VI, figure 1, and the methods of collecting spat, which have been employed there for nearly two thousand years, are shown in Plate XII, figures 1 and 2.

The great antiquity of this method of rearing oysters has been proved by the discovery of a few very interesting ancient Roman pictures of the industry, which are thus described by a famous French oyster cultivator, Coste, (Voyage d' Exploration sur le litteral de la France et de l'Italie, par M. Coste, translated in the report of the United States Fish Commission for 1880.)

"I said at the commencement of this work that the industry of Lake Fusaro was known to the ancients, and that probably Sergius Orata was the inventor; there are two historical monuments which prove that it began, probably, in the time of Augustus, or, as Pliny says, at the time of the orator Crassus, before the war of the Marses. These monuments consist of two funereal vases of glass, discovered, the one in Pouille, the other in the environs of Rome. They have the shape of antique bottles, with large bodies and long necks, and are covered on the outside with designs in perspective, in which, notwithstanding their crude representation, we recognize fish ponds adjoining edifices, and communicating with the sea by arcades. However, if we should entertain doubts of their purpose and meaning, the inscription which accompanies them would fully explain their character. We read upon the vase from Apulia, illustrated by Sestina: Stagnum Palatium (a name sometimes given to a villa upon the banks of Lake Lucrin, owned by Nero), and lower down: Ostrearia. The other vase, which is preserved in the Borgia Museum at Rome (at the present time that of the Propaganda), and of which M. G. B. de Rossi has given an excellent interpretation, bears the following words, written under the objects designed: Stagnum, Neronis, Ostrearia, Stagnum, Sylva, Baia, which plainly shows that the figures have been drawn from edifices, and from places of the famous shore of Baia and Pozzuolo."

"What is most striking in the view of the fish-ponds represented upon these funereal vases is the disposition of the stakes crossing one another in divers directions, and arranged in circles, stakes which were evidently there only to receive and protect the progeny of the oysters."

Although these Italian breeding grounds are so very old, no extension or development of the industry seems to have been attempted until about fifty years ago, when some unknown fisherman, in

the East River, in New York, began practical experiments in this line. The famous French naturalist, Coste, soon after began his investigations and experiments in France.

The East River methods, which have resulted in the American system of oyster farming as it exists in Long Island Sound and on the South Shore of Long Island, will be noticed soon.

Coste's experiments have led to the development of the French system of oyster farming, and they are so interesting and instructive that they should be made known to our people.

In Coste's report for 1858, he states that out of twenty-three natural beds which formerly constituted a great source of wealth, eighteen had been completely destroyed, while the remaining beds had been so impoverished that they no longer yielded enough oysters for planting. In another locality, where thirteen valuable beds formerly furnished employment for two hundred vessels and fourteen hundred men for six months in each year, and yielded an annual harvest valued at $60,000 to $80,000, only three beds remained, and these were so depleted that twenty boats could in a few days carry away all the oysters.

In March and April, 1858, Coste, with the aid of two government vessels, began the work of replenishing these exhausted beds on the coast of France. An area was selected where valuable beds had been destroyed by dredging. These beds were so completely destroyed that there were not enough oysters to supply spat, and six long beds of oysters were accordingly planted and buoyed out. The bottom around these beds was then thoroughly planted with the shells of oysters and other molluscs. Bundles of twigs, six to ten feet long, were then fastened by stone anchors a foot above the bottom, to serve as spat collectors. Six months later these bundles were found to be completely covered with spat, and 20,000 young were counted upon one bundle. The method of using these bundles is shown in Plate XI, figure 1.

Two government farms were then established with a force of 112 persons; and an area of nearly 1,000 acres of exhausted land was stocked in same way. In 1863, during six tides, and upon only one-half of the restocked lands, 16,000,000 oysters were taken. Land was then ceded by the government to individuals, to be cultivated in the same way, and one area of 492 acres was in a few years stocked with oysters valued at $8,000,000.

The following extracts from the translations which have been published by the United States Fish Commission, of Coste's official reports, give a very interesting account of the history of the undertaking:

"1.—Report to His Majesty the Emperor on the Condition of the Oyster Beds Along the Coasts of France, and on the Necessity of Restocking Them."

"Paris, *February 5, 1858.*"

"*Sire:* The domain of the sea, like the earth, may be cultivated; but this domain being public property, to the Government belongs the duty of applying such methods as science has demonstated to be the most suitable for the execution of so grand a scheme, and then leaving to its grateful citizens the harvests which have been prepared by its care."

"I have, therefore, the honor to submit to your Majesty, according to command, the various plans which promise to promote the success of this useful innovation. I will commence with those which relate to the multiplication of oysters on the shores of France."

"The oyster trade has already fallen into such a state of decadence that, unless a prompt remedy be at once applied, the source of production will soon be utterly exhausted."

"At La Rochelle, Marennes, Rochfort, and in the isles of Re and Oleron, out of the 23 beds lately forming one source of wealth of that portion of our shores, 18 are completely destroyed, while

the others, still furnishing a small supply, are seriously injured by the growing invasion of mussels. The cultivators also in these regions, not being able to find sufficient oysters to stock their ponds and *claires* for greening or perfecting, are obliged to seek them at great expense as far off as the shores of Brittany without being able to supply the demand."

"The bay of Saint-Brieuc, so admirably and so naturally adapted to the reproduction of the oyster, and which on its clean, hard bottom formerly contained no less than 15 beds which were continuously dredged, has to-day but 3, from which 20 boats could in a few days carry off the last shell, while in the period of its prosperity more than 200 barks, manned by 1,100 men, were annually employed in the business from the 1st of October to the 1st of April, and realized from it between 300,000 and 400,000 francs."

"In the harbor of Brest and at the mouths of the rivers of Brittany the decadence has not been so great, because these fertile spots have not been subjected to such constant dredging. But inasmuch as our own fishermen are now compelled to resort to these beds, they, like our own, will soon become exhausted."

"At Cancale and at Granville, which are historic grounds for the multiplication of oysters, it is only by good management that they succeed, not in increasing the supply, but in preventing its decline. While this important trade is steadily declining, or remaining stationary, the increased facilities of communication between the sea-board and the interior as steadily augment the demand for these marine articles of food. These products, made costly by scarcity, now bring in our markets fabulous prices, and the inhabitants of the coast, consulting only their immediate wants, and looking only to the present hour, commit depredations which, in the near future, will aggravate their distress."

"Now, Your Majesty, there is for this deplorable state of things a remedy, easy of application, certain to succeed, and which will furnish an incalculable wealth of food for the public. This remedy consists in undertaking, at the expense of the government, under the direction of the administration of the marine and by means of its vessels, the stocking of the shores of France so as to restore the ruined beds, to revive those which are declining, to protect those which are prosperous, and to create new ones wherever the nature of the bottom is suitable. And when by this generous policy these marine fields shall once more become productive, the dredging may be placed under such restrictions that while certain fields are being operated others may lie in repose; a plan which, for a century, has kept the bays of Cancale and Granville from the destruction which injurious dredging has caused everywhere else."

"To give a striking example of the method in which these operations of restocking and of creating new beds ought to be conducted, and of the immense results which may be obtained, I have the honor to recommend to Your Majesty's government that the bay of Saint-Brieuc be set apart for this purpose. There the experiment may be undertaken in a restricted space, supervision will be easy, and in less than six months a fair estimate could be made of the expected results, as from a tree in blossom, provided the artificial beds are planted in March or April, that is, before the spawning season."

"The sum of 6,000 or 8,000 francs, placed at the disposal of the commissary of the marine, in that quarter, would suffice for the purchase of the oysters required for stocking the bay. These oysters should be caught in the open sea, and, if possible, carried immediately by a government steamer to the grounds naturally fitted for them. But, when they are unable to collect enough in one day to complete a cargo, they may store them temporarily near Plevenon, a dependency of Saint-Brieuc, in charge of two custom-houses found there, so as not to start them from this provisional storage to the places where they are to remain before they have a full load."

"With the aid of this simple means, and at a relatively insignificant cost, it will be possible in a few years, if proper precautions be adopted, to realize a considerable revenue in the bay of Saint Brieuc alone."

"2—Report to His Majesty the Emperor on the artificial oyster beds created in the Bay of Saint Brieuc."

"Paris, *January 12, 1859.*"

"*Sire:* Subsequent to the report in which in February last, I had the honor to submit conclusions for your acceptance, Your Majesty, desirous of testing the conclusions I had arrived at, and of ascertaining decisively whether the promises held out by science in regard to the cultivation of marine products could be realized, ordered that the Gulf of Saint-Brieuc be made the theater of the first experiment of oyster culture by the government, executed by means of its vessels, confided to the keeping of its navy, and destined, in case of success, to serve as a model for the creation along the coasts of France of a vast submarine industry, alike profitable in developing the navy and enhancing the prosperity of the coast inhabitants."

"The harbor selected for the accomplishment of this undertaking has a solid bottom, naturally clean, composed of shells or coral, thinly covered with marl or mud, with scattered eel grass (*paillet,*) covering an area of 12,000 hectares everywhere adapted to the sojourn of the parent oysters. The current, which at each tide sets from northwest to southwest and from southwest to northwest, at the rate of one league per hour, brings in fresh waters continually, carries off all unhealthy deposits, and gains by rushing upon the rock-bound coast all the vivifying properties which such constant aeration communicates to it."

"The excellent bottom, the active nature of the limpid waters which cover it, unite, then over this immense submarine domain all the conditions favorable to the multiplication and development of this article of food, which I propose to introduce there, and the products of which we are endeavoring to transform into an inexhaustible annual harvest."

"But while in its work of intervention and conquest science recommended this as an enterprise of great public benefit, empiricism and old fogyism condemned it in advance as rash and visionary. It is only necessary, sire, to recall the various obstacles which had to be overcome, and the amount of perseverance required for the realization of a scheme, the marvelous results of which I already have the honor to make known to Your Majesty; a scheme which aimed to retain on the spawning beds, by means of a simple device, the seed which in a state of nature is dispersed by the currents, and to create sources of wealth wherever the bottoms are not subject to the invasion of mud."

"No region along our coast offered at the same time so vast and so appropriate a theater for drawing public attention to the solution of this double problem; for the bottoms are undisturbed, though the currents rush over them at times with such violence that superficial thinkers prejudged this to be an inevitable cause of failure. Everything there depended on a triumph of art over nature, for it was necessary not only that material for various provinces should be transplanted to a foreign land, but also that the progeny of this exiled population be protected from the perturbation of the waters."

"It will not be out of place, sire, for the honor of science, to state here in detail how the dominion of the sea is made accessible to industry, for, in providing new methods applicable to the business, it creates, for its abstract studies, instruments of investigation which extend its range to regions yet unexplored."

"The planting of the reproductive oysters, opened in the month of March, closed under my supervision towards the end of April. In this brief period 3,000,000 of individuals, some taken in the high seas, others at Cancale, and others from Trequier, were distributed over ten long beds, situated in ten different parts of the gulf, and together representing an area of 1,000 hectares; beds previously traced on a marine map, indicating the productive fields, and provided with signals intended to facilitate the movements of the vessels engaged in the stocking. But in order that the planting should be done with the regularity of a practical farmer, and that the mother oysters should be sufficiently

separated so as not to interfere with each other, a government steam vessel, first the Ariel and then the Antelope, towing the launches, and a *basquine* filled with oysters, would make alternate trips to either extremity of the line, where a small boat, placed crosswise, designated the spot upon which operations should begin. Then, steaming to the other end, designated by another boat, it would go around this in following the long axis of the rectangular space designated by the flag signals, and return to the starting point, like a plow which makes two parallel furrows in a field."

"While our tow-boat was thus engaged, the sailors belonging to it were placed on board the accompanying launches and employed in emptying the hampers, filled with oysters, which they had previously arranged in rows along the decks, and as they were gradually thrown overboard they sank to the bottom and spread themselves over the surface intended to become stocked by their seed. To insure the success of the work, it was not only necessary that the oysters should be planted under the conditions most favorable to their propagation, but also to build around and above them efficient means of securing the progeny and of compelling it to fix itself on the beds where it had commenced to spread; for the planting took place at the time of the first spawning."

"This second end, which transforms the gulf planted into a species of submarine farm, undergoing the various processes of rational cultivation, has been accomplished by means of two contrivances, the simultaneous employment of which has already furnished immense results, and which, in the near future, will permit the increase of the supply to any extent that may be desired, provided propagation keeps pace with the demand."

"One of the contrivances consists in covering the productive bottom with oyster or other kinds of shells, so that every single embryo that sinks shall find a solid body to which it may cling. The shells which we used for this purpose were gathered on the beach at Cancale, by order of M. de Bon, chief of the maritime service at Saint Servan, who was kind enough to lend us his assistance, and were brought to the gulf by a special convoy of fishing smacks, and scattered over the artificial beds in my presence. These shells, however useless, which must be cleared away from the beach at great expense every year, so that they may not encumber it, if carefully preserved hereafter, will become, after drying, valuable instruments of culture."

"The second appliance, which is designed to secure the embryos carried away by the currents, and to receive them on solid bodies placed under the tide-whirls, which do not extend to their depths, consists of long lines of small bundles, placed crosswise like intersecting bars, from one end to the other of each bed. These bundles, perfect collectors of seed, formed of branches from two to three metres in length, tied in the centre by means of a rope to a stone, which holds them thirty or forty centimetres above the bottom, were put in position by men wearing cork jackets, who were instructed to place around each stone a few oysters about to spawn. The rope, which the haste of the first experiment made it necessary to use for anchoring this apparatus, will, of course, soon rot, and it may be necessary to replace it in future by chains made of galvanized iron, which can be constructed in our arsenal shops, and which will form a part of the permanent outfit of this new culture."

"Bearings, carefully taken, form, on special charts well plotted, the means of identifying the points where each line is sunken, so that there will be no difficulty in finding each one, in succession, of raising the bundles and removing the crop of oysters, as easily as the farmer gathers the fruits from his trees."

"Two government vessels, the Pulvier and the Eivel, stationed at opposite points in the gulf, one at Portrieux, the other at Dahoûet, visit each day the artificial beds, while a small cutter, which was constructed by your Majesty's orders, at my request, steams up the gulf and helps to complete the surveillance, besides rendering other necessary assistance in carrying on the work. This little cutter, which is almost indispensable in the enterprise, should be placed under the immediate orders of M., the commissary of the marine at Saint-Brieuc, so that my daily instructions can be promptly executed by a force selected by that agent of the administration. I think, sire, that it is my duty to insist that this essential part of the programme be not forgotten."

"These, sire, are the initiative means which have been adopted for the fertilization of the gulf. Hardly six months have elapsed since they were put into execution, and already the promises which were held out by science have become startling realities. The treasures accumulated by the persevering application of these methods in these fully developed fields exceed the most sanguine expectations. The mother oysters, the shells which were scattered over the bottom, in fact everything brought to the surface by the dredge, is covered with spat; the beach itself is thick with them. Never at Cancale or Granville, in the eras of their greatest prosperity, was such a spectacle of immense reproduction witnessed."

"The bundles bear in their branches and on their smallest twigs bouquets of oysters in such profusion that they resemble the limbs of our fruit trees, which, in spring, are hidden by the profusion of their blossoms. They look like veritable petrifactions. To believe such wonders it is necessary to be an eye-witness of them."

(One of these branches, with the young oysters upon it, is shown in Plate XI, figure 1, of this report. The figure is a copy of one which accompanied Coste's original report, from which these passages are quoted.)

"In order that your Majesty may judge with your own eyes of the extent of these treasures, I caused to be transported to Paris one of these appliances for collecting the spat, together with specimens taken from the several beds. These will testify eloquently in behalf of our successful efforts. The young oysters which cover them are already from two to three centimetres in length. They are simply the seed which, in eighteen months, will ripen and yield an immense harvest. On one bundle alone, occupying no more space in the waters than a sheaf of wheat in a field, as many as 20,000 were found. Now 20,000 oysters, when they are of edible size, represent in value 400 francs, the current price being 20 francs per thousand on the spot. The revenue from this industry will therefore be immense, since one may put down as many spat collectors as he wishes, and since each adult individual forming part of the bed will furnish not less than 2,000,000 to 3,000,000 embryos. The bay of Saint-Brieuc will become in this way a perfect storehouse if, by the junctions of beds already formed, we convert the whole area into a vast productive field."

"All the arrangements necessary for the accomplishment of this great scheme can be promptly executed, sire, if the prosecution of it be entrusted to those from whose intelligent zeal I have received so much aid up to this time. The experience which they have acquired in these first operations is a guarantee that what remains to be done will be brought to a successful issue.

"I therefore hope that in order that I may retain the indispensable assistance of two fellow-workmen, your Majesty will deign to reward their zeal, and appoint from the list of officers M. Levicaire, chevalier of the Legion of Honor, and wearing the medal of Saint Helene, who unites with the best record thirty-nine years of excellent service, and ought to be raised to the rank of commissary of marine at Saint-Brieuc; and that M. Bidaut, lieutenant in the navy, a chevalier of the Legion of Honor, with nineteen years of excellent service to his credit, will be kept in command of the Pluvier, with all his crew, beyond the ordinary period, that is to say, until the scheme that we are now engaged in be entirely accomplished."

"With the assistance of these two distinguished officers and the aid of an inspector of fisheries, whose appointment should be immediate, so that the bay of Saint-Brieuc may be placed on the same footing with Cancale, Granville and Marennes, we hope in less than three years to unite all beds, and have the whole surface of 12,000 hectares under full cultivation. An annual appropriation of 10,000 francs will suffice to carry on the work of clearing out the bottoms, buying supplies of seed oysters, gathering shells, repairing the structures for holding the embryos, organizing other beds of acclimatization like the one already established at Plevenon, and for the creation of perfecting-*claires*, where the fattened oysters are improved by becoming green. When this project is accomplished, the inhabitants of the seaboard will find in the gulf, as in a very productive field, an inexhaustible supply provided by generous foresight, and will witness on the shores an example of the different methods and practices connected with the oyster industry. It will prove at the same time a lesson and a great benefit."

"If your Majesty consent to this proposition I shall immediately transmit to the commissary of the marine at Saint-Brieuc, and to the commander of the Pluvier, all the instructions necessary in executing these delicate operations. But to preserve our artificial beds one more measure must be brought into requisition: To order the dredgers to obtain their supplies at greater distances from the beds, where they may rake the bottom without injuring an enterprise commenced under such happy auspices."

"To sum up, sire, the experiment made in the bay of Saint-Brieuc has been attended with such decisive success that the lessons it teaches cannot be ignored. It proves, by splendid result, that whenever the bottoms are free from mud and slime, industry, guided by science, may reap from the depths of the sea, fertilized by its care, more abundant harvests than can be obtained from the earth. I deem it, therefore, my duty to recommend that your Majesty order the immediate restocking of all our seacoasts, that of the Mediterranean as well as of the ocean itself; that of Algeria and of Corsica, not excepting all the salt lakes found in Southern France, the fruits of which, by multiplying, will become a source of wealth to the poor people who inhabit the shores. But, in order that these operations may be successful, it is necessary that a swift propeller of light draught should be built and devoted exclusively to this service; which vessel, during the spawning season, should be subject to my orders, so that I may visit all the centres of these great phenomena of natural reproduction, where science promises to industry precious revelations."

"Captain Isidore Le Roy, known to the government by his studies upon the fisheries, a pilot experienced in the waters which are to be the scene of our work, well qualified in mechanical arts, and officially recommended for the surveillance of the first and second naval districts, could render me much aid if he were invested with the command of this vessel, heretofore mentioned as necessary to the execution of our plans; and in case your Majesty sees fit to appoint him my coadjutor he should at once report at the College of France, there to be instructed, under my direction, in all that pertains to the cultivation of marine products."

"Among the measures to be taken for the accomplishment of this object, there are, sire, some which experience has already demonstrated to be efficacious, and which, by their immediate application, will produce certain results. But, besides these known facts, there are mysteries which persevering study alone can reveal, and which should be made the object of serious investigation. It will then be necessary to open along our shores vast laboratories, where scientific experiments may be performed, which will furnish new means for the extension of empire of industry. The saline lakes of Southern France, the bays of the ocean, those of Algeria, of Corsica, &c., offer the best opportunities for organizing great districts to be gradually transformed, at your Majesty's desire, into supply centres for the seeding and cultivation of the sea."

"The different edible species admitted by turns into those zoological gardens, so to speak, would be, like the animals in our stalls or in our parks, under the observant eye of those charged with the duty of studying their laws of propagation and of development, investigators placed there as a branch of my laboratory of the College of France. It will then be necessary to enlarge the study rooms and increase the *personnel* and endowment. A skilled artist with his brushes will give a representation of each curious discovery which shall be made in this living museum, and thus prepare plates for one of the most important publications with which the annals of natural history will ever be enriched."

"The unexpected phenomena which I witnessed at Concarneau, in the small ponds of Pilot Guillou, left no doubt in my mind as to the great serviceability of an establishment which will place in the hands of the government the necessary means for executing a work of public utility."

"In the age when, by a sovereign application of the laws of physics, an invisible flame carries thought through conducting wires with which the genius of man has encircled the earth, physiology will exercise its empire over organic nature by an application of the laws of life."

"I cannot conclude this report, sire, without expressing my thanks to Admiral La Place, *prefet maritime* at Brest, for the energetic assistance which he gave to our enterprise by confiding its rapid execution

to the combined care of the commandant of the station at Granville and to the chief of the maritime service at Saint-Servan."

"I am, sire, with profound respect, your Majesty's very humble and faithful servant,"

"COSTE,"

"*Member of the Institute.*"

After the above report was made, M. Levicaire was promoted to the grade of officer of the Legion of Honor, and M. Le Roy was appointed to the command of the Chamois, a steam-vessel which was placed at the orders of those superintending the restocking operations. M. Bidaut, lieutenant of the Pluvier, was retained in command of that vessel.

"3.—Report to His Excellency the Minister of Marine, on the Restocking of the Basin of Arcachon.

"Paris, *November* 9, 1859."

"Sir: In the first edition of a work which is now being republished by order of the Emperor, I demonstrated five years ago, by the help of numerous facts observed at Marennes, at Tremblade, and at the isle of Oleron, that oysters reproduced themselves in as great profusion in the *claires*, *viviers* and *etalages* as in open sea.

"At the sight of these revealed sources of wealth I announced that, by means of appliances for collecting the seed, all the establishments organized along the coasts would soon be transformed into productive areas, where, without quitting the land, the coast inhabitants would have in their hands the inexhaustible treasure which science offers to labor, and I described the instruments which were to be used in securing the possession."

"I hope, sir, in the presence of the wonders accomplished under the eyes of the astonished inhabitants, henceforth anxious to take part in the prosecution of a work in which they at first had no confidence whatever, that your excellency will permit me to restate here the means employed, so that it may again be shown that the most abstract knowledge is everywhere the lever employed in attaining most wonderful results, in the great workshop where the genius of man extends its empire over the world."

"Although the entire bay of Arcachon may be transformed into one vast oyster-bed, there are two localities, the point of Germanau and the space comprised between Estey de Crastarbe and the port of the island of Oiseaux, which are best adapted to the purpose of reproduction. The muddy, pebbly and uneven bottoms will afford every opportunity for the various methods."

"I have, therefore, the honor of proposing to your excellency that the government agents be ordered to proceed at once to the organization of two kinds of model farms, which will be at the same time public storages for seed and great areas for the concentration of the harvests."

"The superabundance of seed which the collecting apparatus cannot hold will spread far and wide over the shells and artificial repositories with which the bottom of different parts of the bay will be covered, and will furnish, both to the hand fishery and the boat fishery, a continually renewed source of food. This portion of the harvest will be common property."

"Those which develop in the reserved cantonments will be distributed in lots to the most zealous seamen, to whom this loan or generous gift will be a means of cultivating, on their own account, beds ceded by the government, and thus creating for themselves a first capital, by which they will pass from a mercenary or laboring condition to that of cultivators. *This will be a part of the recompense.*"

"But in order that nothing shall be left undone that is calculated to expand the business, it will be well to admit, to a certain extent, private enterprise to the benefits of the concessions, obliging it to be associated with the fishermen, whose rights will be protected by contracts made before the proper authority; so that, without making over anything, the government can aid the development of the industry, and attract those who, witnessing its prosperity, feel disposed to engage in the pursuit."

"With these means of action, and the aid of private enterprise, an appropriation of 20,000 francs would be sufficient to transform in two years, with profit to all and honor to the government which extended its help to the enterprise, the bay of Arcachon into a veritable field of abundance. This bay, then, would produce upon its stocked depths, by means of appliances prepared beforehand, immense harvests, the extent of which may be calculated in advance by the result which the permanent depots have already begun to accumulate."

"But shell-fish will not constitute the only harvest taken from this fertile tract. The government can easily create along the coast a no less precious source of production, by building reservoirs connected by trenches with the sea, through which the excess of fish spawn can be carried into the interior; this question has been controverted, and to its discussion I will in a future report call your excellency's attention."

"While awaiting your decision, sir, I beg you to accept a renewed assurance of my repectful consideration."

"COSTE,"

"*Member of the Institute.*"

In accordance with the conclusions arrived at in the above report, two establishments, to be used as models, are already in operation at the designated places in the bay of Arcachon. A second police-boat, the brig Leger, commanded by Lieutenant Blandin, is charged with the surveillance of the bay, and co-operates with M. Filleau, commissary of maritime inscription of that region, in the cultivation of the two beds created by the government. One hundred and twelve grantees (*concessionaires*) associated with registered seamen, now follow this new industry over an extent of 400 hectares which the government has ceded to them.

Coste did not live to see the fulfilment of his prophecy, and while the government farms, which he studied were at first so successful; he met with many accidents and misfortunes, and at last died blind and discouraged, but the industry which he started, and which failed to flourish under government patronage, was taken up and developed by private enterprise, and the following official account of the condition of the waters, when he inaugurated his experiments, was published in 1875:

"Report on the Condition of Oyster Culture in 1875, Preceded by a Report to the Minister of Marine and of the Colonies."

"Versailles, *January* 23, 1875."

"After a long period of quietude oyster culture has recently made considerable advancement. In the basin of Arcachon, especially, it has rapidly developed since 1870. The practical results attained by the improved methods of work have attracted the attention of all the inhabitants of the basin, have even acquired a great notoriety abroad, and have induced many people to engage in this industry. The demands for concessions of grounds have increased to an unusual extent, and at the same time the oyster culturists, already provided with parks, have found themselves much inconvenienced in the establishments they now possess from the lack of room in which to raise the young oysters taken in large quantities from their collectors."

"*A ministerial decision, published in* 1860, *reserved for the general fishery quite an extended area in the basin, upon which the establishment of parks was prohibited. The suppression of this area was asked for by some in the interest of oyster culture, but there was also another party, opposed to this plan, according to whom it was not only necessary to maintain the existing reservations, but also to refuse all new concessions, under the pretext that the multiplication of the parks would injure the general prosperity of the basin.*"

"At the beginning of last year, Vice-Admiral Dompierre d'Hornoy, then minister, instructed me to proceed to these places in order to ascertain the state of affairs at Arcachon, and to report to him *de-visu*.

I returned from this mission convinced that the oyster industry of Arcachon was susceptible of important developments; that it merited favorable attention from the administration, and *that the greater part of the reserved area could be turned over to oyster culture without any inconvenience whatever to the general interests.* The minister, in accordance with propositions which I submitted to him upon this subject, decided on the 28th of January, 1874, *that all the grounds of the basin yet unoccupied should be placed at the disposal of private industry, and in addition a certain number of natural oyster-beds, which need to be taken care of, as they constitute breeding centres indispensable to the maintenance of the parks.*"

"In executing this decision, the first work of dividing the old reserved area was effected during the year 1874 and received the sanction of the ministry on the 19th of last December. Seven hundred and twenty-eight new parks were thus authorized at one time, and were added to the seventeen hundred and six oyster-cultural establishments already existing in the basin. A second work of the same kind was also approved by the minister, and a third will soon follow. At the same time concessions of ground were daily granted in all other parts of the basin and the great number of demands was not lessened. Furthermore, this progress in oyster culture is not limited to the basin of Arcachon. In Morbihan industry and capital favor it in a nearly equal degree. There also oyster culturists, finding the condition of the soil, climate, and locations propitious, have, little by little, perfected their methods and obtained remarkable results."

"From these two centres of activity oyster culture radiates to a greater or less extent in all directions. It has been permanently established in the bay of Mount Saint-Michel and on the sandy borders of the Vivier. It seems in a fair way of becoming re-established on the coast of the island of Noirmoutiers and the island of Re, where it had previously given great hopes of success at the time it was first started there; it is more prosperous than ever on the banks of the Seudre. Finally, it has become in many places the object of attempts which will, without doubt, prove partially successful."

"Aware of the deep interest taken in the coast fisheries by the Admiral Marquis of Montaignac, who, in 1850, was one of the commission, under the presidency of the Count Chasseloup Laubat, to prepare the penal laws of 1852, I have thought that at this time, when oyster culture has received a definite impulse, the minister would read with pleasure a detailed report of its origin, its first phases, and its present condition. I have, therefore, by the aid of documents collected at the bureau of fisheries, prepared this report, which comprises the history of oyster culture and practical descriptions of the most perfected methods of cultivation practiced upon our shores."

"I have the honor to submit this work to the minister, and should he find it worthy of his approbation, I beg he will give it to the public as an aid in extending the knowledge and facilitating the progress of an industry which is still new and full of promise for the future."

"I recommend that this report be published in the Revue Maritime et Coloniale."

"Commissary-General of the Marine, Director of Administrative Affairs."

"Approved." "Signed: DE BON."

"Signed: MONTAIGNAC."

"An Account of the Condition of Oyster Culture in 1875."

"In addition to the taking of oysters by dredging, there exist two very distinct branches of oyster industry, which have hitherto been carried on to very unequal extent."

"The first consists only in the improvement of oysters taken from natural banks. The oysters are taken, so to speak, ready-made, are deposited in localities calculated to give them certain qualities of flavor, shape or color, and are then furnished to consumers after they have acquired these qualities, which increase their market value. It is a sort of stock-raising, analogous to that of the farmer who buys lean cattle and fattens them before sending them to market."

"The second industry consists in taking the oysters when they are in an almost embryonic state, as

soon as they have left the valves of the mother oyster; in favoring the first phases of their development by special care, thus saving from destruction a multitude of germs, which would perish if left to themselves; and subsequently in increasing artificially the harvest of these productions which nature lavishes with so much carelessness and prodigality. This latter industry has been compared to agriculture, which multiplies the productions of the earth in order to meet the constantly increasing demands of mankind; hence the name *oyster culture*, which has of late been applied to it."

"*First attempts made at Saint-Servan.*—It was in France, some twenty years ago, that oyster culture really had its origin.* About the time M. Coste visited Lake Fusaro, in 1853, M. De Bon, then commissioner of marine and chief of the service of Saint-Servan, now director of administrative affairs in the ministry of marine, was directed by the minister to attempt the restocking of the old oyster-beds of the Rance and of the roadstead of Saint-Malo, by means of shell-fish obtained from the beds in the bay of Cancale. In observing the results of these experiments, which succeeded perfectly well, he became convinced of a fact which had, until then, been contested, viz., that the oyster can reproduce itself even after having been transplanted to bottoms which are left bare at each low tide, and on which it has never existed before. He was struck with the facilities thus offered for the obtaining of artificial supplies of spat. He established at Saint-Servan, in the port of Solidor, a sort of experimental park, and commenced a series of experiments to discover means of fixing the spat emitted from the oysters. In the year 1855 he announced to the minister that the question of artificial reproduction was for him definitely settled in the affirmative. In 1858 he asked to be authorized to try in one of the parks at Cancale the system of collecting spat which he had decided upon. It was a sort of floor formed of boards from 15 to 18 centimetres wide (6 to 7 inches), upheld by stakes and placed 20 centimetres (8 inches) above the oysters. Having seen with their own eyes the results of this system, the parkers of Cancale did not hesitate to give it a trial at their own expense during the summer of 1859. The experiment was crowned with complete success. In the month of October in the same year, M. De Bon transmitted to the minister, as a specimen, several boards covered with spat, some from the beds of Cancale and some from the parks of the Rance. His experiments had, moreover, become famous. The prefect of the island of Vilaine had come to pay a visit to the park and had comprehended the scope of the discovery. In pursuance of his advice, M. De Bon sent specimens of the oysters obtained by the new method to a local exhibition which was held at Rennes in August, 1859. These specimens, which were accompanied with a description, attracted much attention, and the jury of the exhibition conferred a silver medal upon the inventor."

"*M. Coste's share in the introduction of the new industry.*—Notwithstanding these satisfactory results, oyster culture would undoubtedly have found difficulty in overcoming the obstacles which prejudice always places in the way of new advances in attracting public attention, and subsequently in securing the costly and persevering efforts necessary to insure its speedy development, had it continued as a purely administrative work, subject to the conditions of prudence and wise reserve which are always imposed upon responsible functionaries. It found in M. Coste a bold champion, who brought to its service his reputation as a man of science, his talent as a propagandist, and the open support of the chief magistrate of the nation, which he had gained by the eloquent ardor of his convictions. Made proficient for this work by reason of his studies on fish-culture, M. Coste had become much impressed by what he saw in Italy, in the parks of Lake Fusaro. He at once conceived the idea of transporting to France the industry which flourished so obscurely near the Gulf of Naples. In the report of his explorations, made January 1, 1855, to the minister of agriculture and commerce, he expressed a desire that the same processes might be tried in the salt ponds of the south of France, and also applied to the natural oyster-beds. He proposed to let down over these oyster-beds in the spawning season large wooden frames to collect the spat, which should be withdrawn at the proper time."

* We shall show further on that the American method of oyster farming originated independently, and several years before the French experiments, in East River, New York.

EXPLANATION OF PLATE VI.

FIGURE 1.—General view of Lake Fusarro, in Italy, (Acheron of the ancients), showing here and there stakes arranged in circles, for collecting spat around the artificial oyster beds. The manner in which these stakes are arranged is shown on a larger scale in Figure 1 of Plate XII.

In other parts of the figure single and double rows of stakes are shown. Between these bundles of branches, like the one shown in Figure 1 of Plate XI, are suspended, as shown on a larger scale in Figure 2 of Plate XII, to collect the spat.

The lake communicates with the ocean through a canal, which is shown on the left of the figure, and near this canal is a smaller lake, in which the oysters which are ready for the market are temporarily placed. (From Coste's Report.)

FIGURE 2.—Map of a system of ponds for the cultivation of oysters. (From Hausser's Report.)

(The cuts for these figures were furnished by Prof. S. F. Baird, Superintendent U. S. Fish Commission.)

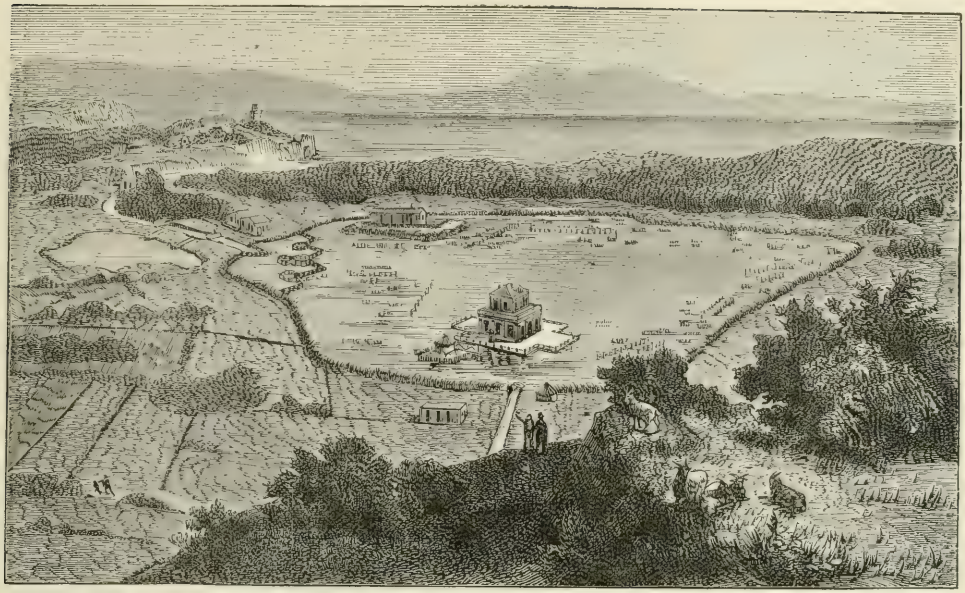


FIGURE 1.

ETABLISSEMENT OSTREICOLE DE LA RIVIÈRE DE CRACH
(Mr le BARON de WOLBOCK)

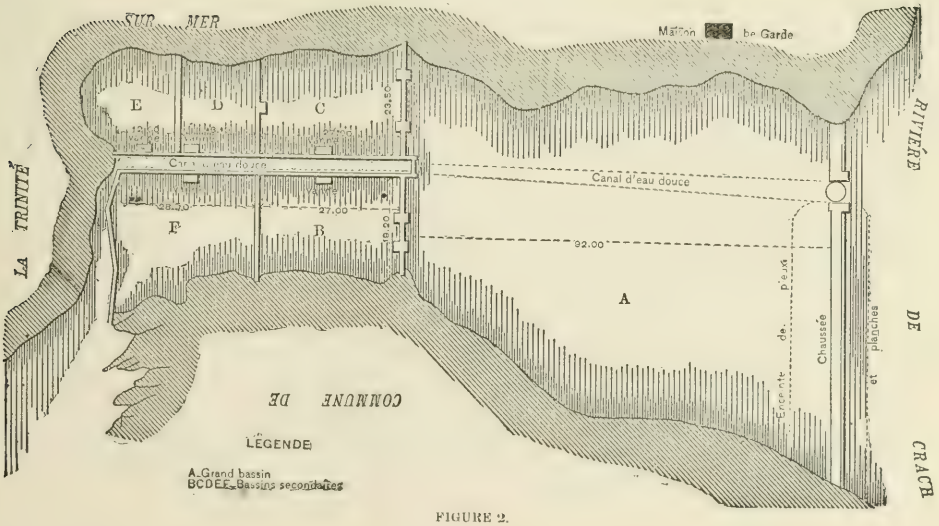


FIGURE 2.

"*His first missions on the coast.*—Two years afterwards, in 1857, the Emperor commissioned him to make experiments in maritime fish culture. Soon thereafter, having received letters of introduction from the minister of the marine to all the maritime officers of the ports, he began to travel along the coast. He visited Saint-Servan in August, 1857. M. De Bon showed him the already decisive results which he had obtained, both in restocking the beds of the Rance and in collecting spat artificially. This was a practical confirmation of his theories, and in many respects a revelation of the means of executing them, for which he was still seeking. He saw with his own eyes the reproduction of oysters upon ground left bare by the tide, a fact which he had long denied and from which he subsequently derived so much advantage. On the 5th of February, 1858, in the first report addressed to the Emperor on the subject of his misson, he asked that a simultaneous experiment in restocking and in oyster culture might be tried on a large scale in the bay of Saint-Brieuc. He predicted its success, and his vivid imagination, entirely given over to the fondest hopes, already saw the coast of France transformed by the same process into an almost continuous chain of oyster beds, furnishing inexhaustible supplies of food."

"*Experiments in the Bay of St. Brieuc.*—This report, which was printed in the 'Moniteur,' attracted much attention. M. Coste received from the minister of marine all the means that he required. Three millions of oysters, purchased at Cancale and Treguier, were deposited (April, 1858) at various points in the bay of Saint-Brieuc, with the aid of two small steamers belonging to the government, which towed the entire flotilla of boats carrying the oysters. On the improvised beds oyster shells were previously spread, to serve as collectors, and, for the same purpose, long rows of bundles of fagots were let down and anchored at a height of 30 to 40 centimetres (12 to 13 inches) above the bottom. Other boats were permanently detailed to watch and keep the new beds in order. Success seemed insured from the first. At the close of the spawning season the collectors brought to the surface were covered with spat. M. Coste thought that now he was about to see his plans realized. He proposed to immediately undertake to restock the entire coast, and the report in which he announced his results in the bay of Saint-Brieuc (December, 1858) received the same publicity as the former one."

"*Attempts at restocking on a large scale.*—From this time onward oyster cultural experiments, both by the department of marine and by private individuals, developed rapidly. In the month of July, 1859, a steamer called the 'Chamois' was placed at the disposal of M. Coste to convey him to such points along the coast as he desired to visit, in order to direct his experiments, and especially to co-operate in the oyster cultural works under the charge of the commissioners of the maritime inscription and of the vessels guarding the fisheries. In January, 1860, two and a half million oysters were purchased at Cancale and distributed through the bay of Saint-Brieuc in order to enrich its bottom. In May and July of the same year two million more were purchased in England and taken to Bordeaux, by the Chamois, whence they were conveyed to Cette by railway for the formation of oyster beds in the Mediterranean. This lot was divided between the pond of Thau and the roadstead of Toulon. The roadstead of Brest was restocked, and an oyster reservation, supplied by large shipments from England, and intended to facilitate the stocking of the surrounding beds, was established in l'Anse de la Forest, near Concarneau. In the basin of Arcachon, explored by M. Coste in October, 1859, there were established by his advice two model parks to serve as breeding beds for the entire basin and for the trial of the different collecting apparatus thus far invented. Seven millions of oysters were deposited in these parks, and a government vessel, together with a coast guard expressly appointed, were charged with their supervision and with the carrying on of all necessary work."

"*First advances made by private industry.—Private industry followed the impulse given by the State. On the coasts of Normandy and Brittany, on those extending from the Loire to the Gironde, and in the basin of Arcachon, concessions were solicited from the minister of the marine; oyster parks were established, and the people engaged with eagerness in experiments at artificial reproduction. Capitalists intrusted their funds to enterprises of this kind, conceived on a grand scale.* The success in several localities was very marked. In the beginning of 1861 M. Coste, in requesting the minister to

grant further extension to his restocking operations, stated that the bay of Saint-Brieuc, where the first experiments had been made, could immediately furnish a harvest of several millions of marketable oysters; that the coasts of the island of Re had been converted into a vast and richly stocked oyster bed; that the basin of Arcachon promised a harvest of incalculable richness; that in the roadsteads of Brest and Toulon the success attained, although less pronounced, was still of a nature to justify the most sanguine hopes; that at La Rochelle and at Marennes the production was equally satisfactory; and, finally, that in the pond of Thau, if the oysters had not reproduced, they had at least grown and acquired qualities which would cause that pond to be considered a place for improving their flavor."

"*Numerous failures—Temporary decline of oyster culture.*—Unfortunately, numerous and bitter disappointments followed in the course of the succeeding years. The artificial beds of Saint-Brieuc were destroyed by inclement weather, the oysters being scattered, and the bundles of fagots broken apart and thrown upon the shore; they never rallied from this disaster. The roadstead of Brest became again impoverished, in consequence of the imperfect reproduction of the oysters deposited there, and the plundering operations of the fishermen. The experiments made in the Mediterranean failed completely. The parks of the islands of Re and Oleron and of La Rochelle, after a few years of prosperity, rapidly declined, and were almost entirely abandoned. It was the same at Cancale and in the Rance, where the attempts at oyster culture, begun by M. De Bon, resulted unsatisfactorily not long after his departure; the majority of the parkers abandoned the work. Finally, the report of the maritime authorities stated that in the basin of Arcachon, at the close of 1865, the government parks were flourishing, but the natural beds were impoverished and private industry was prostrated because of the failure to collect spat."

"*Causes of this decline.*—What were the causes of these failures, which seemed to indicate the ruin of all hopes based upon oyster culture? They were manifold; in the first place, ignorance or neglect of the natural laws governing the formation and continuance of oyster beds; secondly, imprudent attempts at restocking, or cultivation under unfavorable circumstances, quite excusable, however, at the outset of a new enterprise; and lastly, the inexperience of the oyster culturist, all of whom were green hands at the business, the uncertainty which prevailed as to the choice of favorable localities, the methods to be followed, and the apparatus to be used as collectors."

"*Action of the department of marine.*—While seconding the efforts of M. Coste, the department of marine did not share in his illusions. It rightly considered that the renewal and enlargement of our oyster beds, exhausted by the excessive drain upon them, could not be accomplished either as speedily or completely as he had anticipated. The department was not, therefore, discouraged by the failures it had encountered. It was this department, in fact, that had really opened the way, both by its experiments in restocking, commenced in 1852, and by the promulgation of the decrees of July 4, 1853, concerning coast fishing, which decrees laid the foundation of a rational system of regulations as to the taking of oysters."

"*The coast fishery regulations of 1853 with reference to the oyster.*—The main feature of this system of regulations are the prohibition against taking oysters at times not allowed by the maritime authorities; the determination of the proper time for taking them dependent upon the advice of special commissions that visit the oyster beds annually; the reservation of beds found to be impoverished or calculated to answer as centres of reproduction: and, finally, the obligation imposed upon fishermen to throw back on to the beds or preserve in the parks the young oysters which have not yet attained a certain size. Wherever it has been possible to enforce these rules continuously, and at the same time keep a sufficiently close watch to prevent the plundering operations of fishermen and other people living upon the shore, the marine authorities have succeeded in securing the prosperity of the oyster beds, provided they were established upon bottoms naturally productive and not entirely exhausted; the success of enterprises whose object is to reconstruct beds, of which not a trace remains, or to create entirely new beds is much more problematical. In this latter case the lessons taught by experience have not been lost. Since 1865 the department, without refusing to engage in all attempts at starting new beds, has especially endeavored to maintain the already existing ones, to improve them by timely cleansing or by the addi-

tions of shell-fish brought from richer localities, and, finally, to strengthen the watch upon them, which is the best method of preserving them. Thus, in several localities, they have been gradually raised from the decay into which they had fallen."

"*Results of the continued enforcement of these regulations.*—Oyster culture, properly so called, has advanced continuously, and in the course of its progress there has been brought to light a fact of prime importance, viz., that the artificial breeding of oysters can scarcely be successful excepting in the neighborhood of the natural spawning beds. Thus the oyster park of the island Re became sterile as soon as the neighboring natural beds which supplied it had disappeared. The abandonment of the attempts at oyster culture at Cancale was contemporaneous with a prolonged impoverishment of the oyster beds in the bay of Mont-Saint Michel; these beds are now becoming filled up again, and oyster-cultural industry has reappeared upon the shores of that bay, at Vivier, where it is increasing daily. It is the same at Arcachon and in the rivers at Morbihan. The oyster propagates well in parks, as was demonstrated by M. De Bon, and perhaps at some future time it will be possible by improved methods to collect the spawn artificially produced in sufficient quantities, especially if the operation be performed in a favorable medium; but at present an abundant supply of spat from large natural beds is essential to success."

"*Progress made by private industry—Improved methods—Revival of oyster culture.—On the other hand the oyster-culturists, taught by their own experience and by the results attained through the government experimental parks, became more self-reliant; they improved their implements and their methods of work. It may be affirmed that in the two principal centres in which it is now carried on, the basins of Arcachon and Morbihan, this industry then emerged from its period of uncertainty. The great profits realized there during the past few years have brought oyster culture again into favor and turned toward it a current of labor and capital much greater than that which flowed in the same direction after the publication of M. Coste's report. Requests for concessions of parks are received by the minister of marine from all quarters of the coast. Attempts are being made to reconstruct old and abandoned establishments, while new ones are being started in the majority of localities where others formerly existed. Those seeking grants desire particularly the unclaimed localities in the basin of Arcachon and the rivers of the marine sub-district of Lorient, certain that they will receive in the future what is promised by the present.*"

"*Rapid increase in the number of oyster-cultural establishments at Arcachon.—At the close of* 1871 *the parks controlled by private parties in this basin numbered* 724 *and occupied a total area of* 588 *hectares* (1,450 *acres*); *at the close of* 1872 *they were* 1,133 *in number and occupied an area of* 1,061 *hectares* (2,625 *acres*); *at the close of* 1874 *they numbered* 1,706 *and covered an extent of* 1,733 *hectares* (4,310 *acres*), *not counting the portion formerly included in the reserved zone but now given over for parking. The denomination 'Reserved Zone' was applied to a considerable section of the basin in which parks were prohibited in order to retain a common fishing ground which could be frequented by all. In view of the great increase in oyster culture at Arcachon, both to satisfy the claims of the old parkers, who complained that they were cramped for room, and to meet the new demands which were constantly increasing in number, the minister of marine decided, on January* 28, 1874, *to open up the greater portion of the reserve zone to private industry. The remainder of this zone, positively withheld from private demands, comprises exclusively the natural beds of the basin with their immediate surroundings, which it is important to protect against all intrusion, as the prosperity of the parks depended upon their preservation. In pursuance of the ministerial decision of January* 28, *the first work of dividing off the sections for distribution was carried on during the year* 1874; *a decree has just been issued for the formation of* 728 *new parks, which, added to the* 1,706 *now existing, will make a total of* 2,434 *concessions and an extent of* 2,669 *hectares* (6,625 *acres*) *to be occupied by oyster culture. A second work of the same character has just terminated; a third will soon follow.*"

"*Prosperous condition of the establishment at Morbihan.*—In Morbihan the development of oyster culture is no less striking. The section of Vannes contains nearly 200 oyster parks, while that of Auray

will soon have 300, and requests are still coming in. Thus, persons in all stations of life are engaging in oyster culture, either by investing their capital in it or by laboring for it. Many of them are without experience in the matter, and it therefore seems proper and opportune to add to this brief historical sketch a few practical remarks concerning the processes now in use for the cultivation of the oyster. A knowledge of the processes which have the authority of success will, perchance, guide inexperienced oyster-culturists in the right direction and prevent mistakes; it may also incite others who are still indifferent or timid"

One of the most interesting and instructive lessons to be learned from this history of oyster farming in France is that private industry in this field, as in all others, can accomplish more than government influence, and I have marked with italics in this last extract several passages which show that, as the cultivation of private farms spreads, the advisability of devoting all suitable grounds to this use becomes more and more apparent.

Experience the world over teaches that the most efficient agent for the preservation and development of natural wealth is private ownership.

The opposition in Maryland at present to the granting to private holders of any natural oyster bed is very strong indeed, but little insight into the future is needed to perceive that the disappearance of this feeling would result in an enormous increase in the prosperity of our people.

Oyster Farming in America.

The American system of oyster farming, which presents some features of resemblance to the French system, and also many differences, has grown up as the result of private enterprise, without any help or any direct encouragement from government.

The French people are generally held to be the originators of modern oyster farming, but, as an American, I take pleasure in pointing out that our own industry, which is now so extensively developed in Connecticut, has not been borrowed from France, but has grown up independently.

Several years before Coste and De Bon commenced their experiments, the oystermen of East River, having observed that young oysters fastened in great numbers upon shells, which were placed upon the beds at the spawning season, started the practice of shelling the beds, in order to increase the supply, and in 1855, or three years before Coste represented to the French Emperor the importance of similar experiments, the State of New York enacted a law to secure to private farmers the fruits of their labor, and a number of persons engaged in the new industry on an extensive scale. Among these pioneers in this field were Mr. Fordham, Capt. Henry Bell, Mr. Oliver Cook, Mr. Weed, Mr. Hawley and others.

The industry has grown steadily from that time, and East River is now said by Ingersoll to be the scene of the most painstaking and scientific oyster culture in the United States, and the interest and importance of the subject is so great that I quote the whole of Ingersoll's account of its origin, development, and present methods:

"I have no doubt that, whatever was the date of its origin, the credit of first truly propagating oysters from seed caught upon artificial beds or prepared receptacles belongs to the men of City Island. It had been a matter of common observation that any object tossed into the water in summer became covered at once with infant oysters. The sedges along the edge of the marshes, and the buoys, stakes and wharf-piles, were similarly clothed. If the circumstances were favorable this deposit survived the winter, and the next spring the youngsters were large enough to be taken and transplanted. It was only a short step in logic, therefore, to conclude that if objects were thrown thickly into the water on purpose to catch the floating spawn, a large quantity of young oysters would be secured, and could be saved for transplanting at very slight expense. The next question was—What would best serve the purpose? Evidently, nothing could be better than the shells which, year by year, accumulated on the shore from the season's opening trade. They were the customary resting-places of the spawn, and at the same time were cheapest. The City Island oysterman, therefore, began to save his shells from the lime-kiln and the road-

master, and to spread them on the bottom of the bay, hoping to save some of the oyster-spawn with which his imagination densely crowded the sea-water. This happened, I am told, more than fifty years ago, and the first man to put the theory into practice, it is remembered, was the father of the Fordham Brothers, who still pursue the business at City Island. In 1855 Captain Henry Bell, of Bell's Island, planted shells among the islands off the mouth of Norwalk River, and a short time after, under the protection of the new law of 1855, recognizing private property in such beds, Mr. Oliver Cook, of Five Mile River, Mr. Weed, of South Norwalk, Mr. Hawley, of Bridgeport, and others, went into it on an extensive scale. Some of these gentlemen appear never to have heard of any previous operations of the sort. Discovering it for themselves, as it was easy and natural to do, they supposed they were the originators; but if any such credit attaches anywhere, I believe it belongs to the City Island men. It was soon discovered that uniform success was not to be hoped for, and the steady, magnificent crops reaped by the earliest planters were rarely emulated. Many planters, therefore, distrusted the whole scheme, and returned to their simple transplanting of natural-bed seed; but others, with more consistency, set at work to improve their chances by making more and more favorable the opportunities for an oyster's egg successfully to attach itself, during its brief natatory life, to the stool prepared for it, and afterward to live to an age when it was strong enough to hold its own against the weather. This involved a closer study of the general natural history of the oyster."

"The first thing found out was that the floating spawn would not attach itself to or 'set' (in the vernacular of the shore), upon anything which had not a clean surface; smoothness did not hinder—glass bottles were frequently coated outside and in with young shells—but the surface of the object must not be slimy. It was discovered, too, that the half-sedimentary, half-vegetable deposit of the water, coating any submerged object with a slippery film, was acquired with marvelous speed. Thus shells laid down a very few days before the spawning-time of the oysters become so slimy as to catch little or no spawn, no matter how much of it was floating in the water above them. This taught the oystermen that they must not spread their shells until the midst of the spawning season; that one step was gained when they ceased spreading in May and waited until July. Now, from the 5th to 15th of that month is considered the proper time, and no shell-planting is attempted before or after. This knowledge of the speed with which the shells became slimy, was turned to account in another way. It was evident that the swifter the current the less would there be a chance of rapid fouling. Planters, therefore, chose their ground in the swiftest tideways they could find."

"The mere manner of spreading the shells was also found to be important. If they are rudely dumped over, half their good is wasted, for they lie in heaps. The proper method is to take them from the large scow or sloop which has brought them ashore, in small boat-loads. Having anchored the skiff, the shells are then flirted broadcast in all directions, by the shovelful. The next boat-load is anchored a little farther on, and the process repeated. Thus a thin and evenly distributed layer is spread over the whole ground. Just how many bushels a man will place on an acre depends upon both his means and his judgment. If he is shelling entirely new ground, he will spread more than he would upon an area already improved; but I suppose 250 bushels to the acre might be recommended as an average quantity. Having spread his shells in midsummer, the planter, by testing them early in the fall, can tell whether he has succeeded in catching upon them any or much of the desired spawn. The young oysters will appear as minute flakes, easily detected by the experienced eye, attached to all parts of the old shell. If he has got no set whatever, he considers his investment a total loss, since by the next season the bed of shells will have become so dirty that the spawn will not take hold if it comes that way. Supposing, on the contrary, that young oysters are found attached in millions to his cultch, as often happens, crowding upon each old shell until it is almost hidden, what is his next step?"

"The ordinary way in the East River and elsewhere, is simply to let the bed remain quiet, until, in the course of three or four years, such oysters as have survived are large enough to sell, when the bed is worked—at first, probably, with tongs and rakes, getting up the thickest of the crop. This done, dredges

are put on, and everything that remains—oysters, shells, and trash—is removed and the ground left clean, ready for a second shelling, or to be planted with seed, perhaps right away—perhaps after the area has lain fallow, exposed, uncovered to the influences of the sea for a year. Oystermen have an idea (probably well founded, though badly theorized upon) that this improves the bottom for oyster-culture, as much as a similar rest would the soil of an upland field for agriculture."

"In the process of growth of the young oysters lodged upon the fields of cultch, when left undisturbed, there is, and must of necessity be, a great waste under the most favorable circumstances. Leaving out all other adversities, this will arise from over-crowding. More 'blisters' attach themselves upon a single shell than can come to maturity. One or a few will obtain an accession of growth over the rest, and crowd the others down, or overlap them fatally. Even if a large number of young oysters attached to a single stool do grow up together equally, their close elbowing of one another will probably result in a close, crabbed bunch of long, slim, unshapely samples, of no value save to be shucked. To avoid these misfortunes, and, having got a large quantity of young growth, to save as much as possible of it, the more advanced and energetic of the planters, like the Hoyts, of Norwalk, pursue the following plan: When the bed is two years old, by which time all the young oysters are of sufficient age and hardiness to bear the removal, coarse-netted dredges are put on, and all the bunches of oysters are taken up, knocked to pieces, and either sold as 'seed,' or redistributed over a new portion of bottom, thus widening the planted area, and at the same time leaving more room for those single oysters to grow which have slipped through the net and so escaped the dredge. The next year after, all the plantation, new and old, is gone over and suitable stock culled out for trade, three-year-old East River oysters being in demand for the European market. This further thins out the beds, and the following (fourth) year the main crop of fine, well-shaped, well-fed oysters will be taken, and during the succeeding summer, or perhaps after a year, the ground will be thoroughly well cleaned up, and prepared for a new shelling."

"All these remarks apply to a reasonably hard bottom, which requires no previous preparation. In portions of Long Island Sound, especially off New Haven, it has been needful to make a crust or artificial surface upon the mud before laying down the shells. This is done with sand, and has been alluded to in the chapter on New Haven harbor."

"Just what makes the best lodgment for oyster-spawn intended to be used as seed, has been greatly discussed. Oyster-shells are very good, certainly, and as they are cheap and almost always at hand in even troublesome quantities, they form the most available cultch, and are most generally used. Small gravel, however, has been tried on parts of the Connecticut coast with great success, the advantage being that not often more than one or two oysters would be attached, and therefore the evil of bunchiness would be avoided. Where scallop shells, as in Narragansett bay, or, as in northern New Jersey mussels and jingles, *Anomia*, can be procured in sufficient quantities, they are undoubtedly better than anything else, because they not only break easily in culling, but are so fragile that the strain of the growth of two or more oysters attached to a single scallop or mussel-valve, will often crack it in pieces, and so permit the several members of the bunch to separate and grow into good shape, singly. I am not aware that any of the elaborate arrangements made in France and England for catching and preserving the spat have ever been imitated here, to any practical extent. The time will come, no doubt, when we shall be glad to profit by this foreign example and experience."

"Although the effort to propagate oysters by catching drifting spawn upon prepared beds has been tried nearly everywhere, from Sandy Hook to Providence, it has only, in the minority of cases, perhaps I might say a small minority of cases, proved a profitable undertaking to those engaging in it; and many planters have abandoned the process, or at least calculated but little upon any prepared beds, in estimating the probable income of the prospective season. This arises from one of two

causes: 1st, the failure of spawn to attach itself to the cultch; or, 2d, in case a 'set' occurs, a subsequent death or destruction."

"The supposition among oysterman generally has been that the water everywhere upon the coast was filled, more or less, with drifting oyster-spat during the spawning season, whether there was any bed of oysters in the immediate neighborhood or not. In other words, that there was hardly any limit to the time and distance the spat would drift with the tides, winds and currents. I think that lately this view has been modified by most fisherman, and I am certain it greatly needs modification; but, as a consequence of the opinion, it was believed that one place was as good as another, so long as there was a good current or tideway there to spread shells for spawn, whether there were any living oysters in proximity or not. But that this view was fallacious, and that many acres of shells have never exhibited a single oyster, simply because there was no spat or sources of spat in their vicinity, there is no reason to doubt."

"Having learned this, planters began to see that they must place with or near their beds of shells living mother-oysters, called 'spawners,' which should supply the desired spat. This is done in two ways—either by laying a narrow bed of old oysters across the tideway in the centre of the shelled tract, so that the spawn, as it is emitted, may be carried up and down over the breadth of shells waiting to accommodate it,-or by sprinkling spawners all about the ground, at the rate of about 10 bushels to the acre. Under these arrangements, the circumstances must be rare and exceptional when a full set will not be secured upon all shells within, say twenty rods of the spawners. Of course fortunate positions may be found where spawn is produced from wild oysters in abundance, or from contiguous planted beds, where the distribution of special spawners is unnecessary; yet even then it may be said to be a wise measure."

"The successful capture of a plenteous 'set,' however, is not all of the game. This must grow to salable maturity before any profits can be gathered, and it so often happens that the most promising beds in September are utterly wrecked by January, making a total loss of all the money and labor expended, that more than one planter has decided that it does not pay to attempt to raise oysters upon shells, so long as he is able to buy and stock his grounds with half-grown seed—a decision which may be based upon sound reasoning in respect to certain localities, but which certainly will not apply to all of our northern coast."

"To what causes the well-filled artificial beds of infant oysters owe the destruction which seems often to overtake them in a single night cannot always be told; we are not sufficiently acquainted either with the oyster or the conditions under which he lives to detect the fatal influence. It is easily perceived, however, that these propagation beds offer an unusual attraction to all the active enemies of the oyster, such as winkles, drills or borers and starfishes, since they find there food not only in superabundance, but thin-shelled and tender, so as to be got at in the easiest manner. It has very frequently happened, in the East River, that starfishes alone have not only eaten up many acres of young oysters in a single season, on shelled ground, but so colonized there as to ruin utterly that tract for any future use, so long as they remained. It is certain that the half-grown transplanted seed is less attractive to oyster enemies than the propagation beds; but when, as frequently occurs, the latter survive misfortune and attack, the yield of profits is so great as amply to compensate for the risk. Those who do not catch any or sufficient seed for their purposes, upon areas of shells or other cultch, annually procure young oysters of natural growth, or 'seed' with which to stock their beds."

"The great drawback to East River oyster-planting, of every kind, is the abundance of enemies with which the beds are infested. These consist of drum-fish, skates, and, to a small degree, of various other fishes; of certain sponges and invertebrates that do slight damage; and of various boring mollusks, the crushing winkle, and the insidious starfish or sea-star. It is the last-named plague that the planter dreads the most, and the directly traceable harm it does amounts to many tens of thous-

ands of dollars annually in this district alone. Indeed, it seems to have here its headquarters on the American oyster-coast; but as I shall devote to it a special description in my chapter on the 'Enemies of the Oyster,' I will only mention here the fact of its baleful presence, which has utterly ruined many a man's whole year's work."

Ingersoll states that 20 bushels of shells laid down anywhere in the upper part of Barnegat Bay, New Jersey, will produce 100 bushels of seed oysters, but that there is no protection for this industry, as popular construction makes such beds "natural ground."

At Brookham Bay, off the south coast of Long Island, in the region of the well-known "blue point" oysters, it has been the custom for several years to lay down shells, scrap-tin, &c., for the attachment of the young, and when this is done near any oyster bed, or whenever spawning oysters are planted among the shells, there is rarely a failure to get plenty of young.

The Delaware planters often find that after a bottom has been used for many years for planting, the young oysters grow upon the shells which gradually accumulate and a very valuable artificial oyster bed is thus established. The law-abiding citizens respect the private ownership of these beds, and they are a source of wealth to their possessor.

Within the last three or four years, the State of Connecticut has passed laws to develop and protect the oyster-farming interest, and it has accordingly developed with wonderful rapidity in this State, and within the last year the adjoined State of Rhode Island has passed laws to secure a similar condition of things.

The history of the growth of the Connecticut industry is given in another place, under the heading, "Oyster Industry and Oyster Laws of Connecticut," and it is not necessary to repeat it here, but I quote from the "Report of the Shell-Fish Commissioners," of Connecticut, for 1882, the following account of the method of cultivating a private farm in that State.

I also quote from their report for 1883, the following statement of the present condition of the industry:

"The deep-water cultivators proceed in three different ways to make beds. (1.) The bottom being properly cleared off, the seed oysters, mixed with the gravel, jingles and other shells just as they are gathered from the natural beds, are distributed thereon more or less uniformly, and there left to grow. (2.) Or the bottom is spread over with clean oyster shells just before the spawning season begins, and brood oysters, twenty-five bushels to the acre, are distributed over the bed. (3.) Or, if the bed is in the neighborhood of natural beds, the shelled bed is left without further preparation to catch the spawn as it is drifted above it. Sometimes the shells fail to 'catch a set,' and this makes it necessary to rake over the shells the following year, or to cover them over with more fresh shells for the next spawning. There is always an abundance of spawn in the waters of the sound, and when a set is secured an enormous crop is the result. On a private deep-water bed, during the past summer, the dredge was drawn at random in the presence of the commissioners, and from an ordinary-size shovelfull there were counted 206 young oysters in excellent condition of the average size of a quarter of a dollar. As many as a hundred young oysters have been counted growing on a medium-sized oyster shell."

"The beds are carefully tended, and no pains are spared to kill all the enemies of the oysters found among them. By continual vigilance the private beds are kept comparatively free from them. The larger proprietors of deep-water beds use steamers for this work, as also in doing their work of planting, raking over and dredging, and they use larger dredges than the sail vessels can, as they are also worked by steam at a great saving of labor and expense. When the oysters have grown on these beds to a merchantable size they are sometimes sold directly from the beds, but more frequently they are transplanted into brackish or fresh waters, where they are permitted to remain for a short period to freshen and fatten for market."

"The foregoing table affords the ground for the assumption that by the time of the opening of spring work, in 1883, 45,000 acres of ground will have been deeded to applicants by the Commissioners. These, with the 45,000 acres deeded by the towns prior to May, 1881, will show an aggregate of 90,000 acres held by cultivators under State jurisdiction."

"Of this vast area a large portion has been cleared up and shelled. One firm has laid down 250,000 bushels of shells. Several large growers have laid down as many as 200,000 bushels each. A still larger number have scattered a hundred thousand, fifty thousand and twenty thousand each. There are about 30 steamers engaged in the business, besides a very large number of sailing vessels. Shells that but a few years ago were almost worthless have increased in value, and are sought after far and near. It is estimated by competent judges that the number of acres under cultivation is at least double what it was one year ago. With trifling exceptions good sets have been secured upon the beds, and if no unusual accidents occur, the crop, the next two years, will be enormous. One cultivator alone looks for no less than 1,000,000 bushels of marketable natives from his own grounds. Several other growers, individuals and companies, are looking for large crops. And all are planning to still further extend their farms."

"It does not admit of a doubt that the business of oyster growing as carried on in the waters of the Sound is exceedingly profitable."

SPAT COLLECTORS.

During the period of his employment by the French Government to replenish the oyster grounds, Coste devised a number of plans for furnishing an attachment for the oyster spat, and these devices have been greatly improved by other experimenters.

Most of them could be employed in our own waters with advantage, and in order to make our people acquainted with them, we will give a brief description of the more important substances which have been thus employed. Some of them are adapted for certain localities while others can be used to best advantage under other conditions. Our people have long been noted for their ingenuity, and there is no doubt, that as the great importance of oyster farming comes to be appreciated among us, we shall have many great improvements in the methods of procuring seed oysters, better adapted for our own needs than any which are here described, but our account will serve to show our people the general direction in which their inventive skill must be directed.

Oyster Shells.—At present, no spat collector seems to be better adapted for use in our waters upon hard bottoms, than oyster shells, and they are now the cheapest collectors that can be used.

In order to serve for this purpose the shells must be perfectly clean, and as the old dead shells, which have lain for a long time upon the oyster-beds, are torn to pieces by the boring sponge and covered with mud and slime, hydrioids, sea-weed and sponges, they are much less effective than those which are placed in the water just before the spawning season.

In regions where there is no danger from frost, or where the young growth is to be planted in deeper water before winter, the shells may be deposited at or even above low-water mark, and in the sounds of North Carolina oysters thrive even at high-tide mark. The shells should be deposited in the early summer—in June, July and August—in localities where there is enough current to sweep the swimming young past them. A hard bottom is to be preferred, but this method may be employed with great advantage upon any soft bottoms which are near the surface. In this case the shells should not be uniformly distributed, but placed in piles or ridges. If these ridges are properly arranged with reference to the direction of the current, they will produce secondary currents, and will thus cause the soft mud to flow off between them. In this way any bottom which is bare or nearly bare at low tide, and which is exposed to the winds and waves, may in time be swept nearly clear of mud. Each time the tide comes in the mud is stirred up and suspended in the water, and as the tide ebbs this suspended

matter is swept into the channels between the obstructions, and is carried away. Shells are very effective as spat collectors, and we give in Plates I, II, III and IV several figures of shells which have thus become covered with young oysters. Shell wharves built out into deep water, so as to catch and turn the passing current, are often found to be covered with young oysters at all stages of growth and in good condition for planting.

In shallow waters, when the shells are uncovered at low tide, they may be examined to pick out for distribution upon the planting grounds, those which have young oysters upon them, but in deeper waters the shells must be picked up with tongs or dredges, or they may be strung upon wires and sunk in deep water on suitable frames.

The chief objection to the use of shells is that the method is a wasteful one. It is not unusual for fifty or a hundred young oysters to fasten upon one shell, and as the shells are too strong to be broken without injuring the young oysters, these cannot be detached, and most of them are soon crowded out and killed by the growth of the others.

The use of tiles has, therefore, been introduced in France to avoid this loss.

Tile collectors.—As tiles can be employed without difficulty in deep water, they are well adapted for use in our bay. Those which are used in France are much like a common drain pipe sawed in two longitudinally. They cannot be obtained in our markets at present, although they could be made very cheaply if there were any demand for them. Each tile is about 18 inches or 2 feet long, 6 or 8 inches wide, concave on one side and convex on the other. The shape of the tile is important, as nearly all the oysters fasten themselves upon the concave surface. They adhere so firmly that it is difficult to detach them without injury, and to avoid this the French oyster breeders coat the tiles with a thin whitewash, which can be scaled off with the young oysters when these are large enough to be distributed upon the planting grounds.

The following is an account of the method of coating the tiles as employed in France:

"What is most remarkable concerning liming is the fact that both quicklime and hydraulic cement are decomposed by sea-water. Hydraulic cement hardens in fresh water; but salt water, although it permits of a first hardening, in the course of time produces complete decomposition."

"This change is favorable to the removal of the young oyster, and to the assimilation of lime by the young."

"By combining these two substances, hydraulic cement and quicklime, the oyster-culturists of Morbihan, in all cases, attain the desired results, so far as this particular point is concerned."

"If some of our culturists still seem to ignore the existence of a principle in the use of lime, as necessary for the attachment of young oysters, there are others who, without strongly insisting upon it, still affirm this truth. We may cite a few instances: 'Quicklime,' says M. Alphonse Martin, 'always retains a little moisture, thus placing at the disposal of the oyster all the materials which it needs.'"

"'A coating of lime,' says M. Gressy, 'not only permits of the easy removal of the oyster, but also constitutes a substance eminently favorable for collecting the young. This fact is so well known that no one to-day would place a collector in the sea without having first dipped it in lime.'"

"Finally, Dr. Henri Leroux writes as follows: 'We will not now insist upon the necessity of coating the tiles in order to obtain a good supply of oysters, as experience has sufficiently proved this fact. The tiles covered with lime will give three times as many oysters as those without it.'"

"This principle being admitted, the liming is done in two very different ways at Morbihan according to whether it is intended to entirely free the oysters from the tile, or to allow a portion of the tile to remain attached to each shell."

"When we come to speak of the removal of the oysters from the collectors, we will make some remarks concerning the matter of leaving a portion of the tile attached to the young. For the present

we will merely state that under that system the tile is cut, leaving a portion adhering to each oyster, forming a sort of heel."

"Some of our culturists, such as M. Gressy and M. Henri Leroux, who breed oysters in this manner, cover their tiles with a slight coating of hydraulic cement. The young oyster attaches itself to the cement, but the coating being very thin is soon worn away, leaving the oyster quite firmly fixed to the tile."

"Others, on the contrary, who, six months after the collectors have been set, prefer to separate the oysters entirely from the tile with the blade of a knife, generally cover the tile with two layers, and proceed in a different manner. We cannot do better than to give their method of procedure in their own language:"

"M. Eugene Leroux says: 'I procured some quicklime, which was slacked just as it was to be used, and was put, while still in a state of ebullition, into a large vat, where two-thirds the same quantity of sand had been placed. My men stirred the mixture until it had attained the consistency of clear broth. The collectors had been made ready, and, held by the lower end, were dipped into the vat. One immersion sufficed, after which the women took them in hand-barrows and exposed them to the air to dry before setting them up. This excellent coating should be prepared with fresh water only; sea-water prevents its adhering for any length of time to the tiles, and if it comes off the labor is of course lost.'"

"M. Liazard states: 'It was necessary to find a substance which, placed between the outer coating of the tile would decompose after remaining long in the water, and thus leave the coating almost free. I tried different pastes, all of which gave good results, but it was necessary to select the most economical. I was satisfied with a mixture made of flour and a small quantity of the scrapings of potatoes, boiled in a sufficient quantity of water to produce a thin paste. The tiles were dipped in this, and after they were dry they were passed through a bath of hydraulic cement. I have always succeeded with this mixture; it is quickly made and costs but little. Every time I have neglected to use it I have regretted it.'"

"M. Alphonse Martin says: 'I first plunge each tile into a milk of quicklime, and when this coating is quite dry I again dip the tile into a bath of hydraulic cement.'"

"M. de Wolbock generally uses two layers of hydraulic cement."

"It seems to us rational that, when not intending to leave the oyster attached to the tile, we should resort to two layers, the first of quicklime, which will not adhere very firmly, and the second of hydraulic cement. The first facilitates the removal of the oyster and the second the adherence of the young."

Tiles may be used as spat collectors in either deep or shallow water.

On the French coast they are chiefly employed above low tide mark, or in very shallow water, and they are then spread out on a considerable area.

In some cases lines of stakes are driven into the ground, about a foot apart, transverse string pieces are fastened to them about a foot above the bottom, and a row of tiles is laid upon the latter, concave surface down, another row of tiles is placed at right angles upon the first layer and the whole is weighted with stones.

Another method is to place them in rows like card houses.

The various methods of placing the tiles in shallow water are shown in Plates V and VII. They should be placed in position while the oysters are spawning, as they soon become slimy and covered with dirt. As soon as the oysters are large enough to handle they should be removed and distributed over the planting ground, as they are often so crowded together on the tiles that they have no room to grow.

When used in deep water the tiles may be fastened to a frame, which may be sunk upon or near a natural bed.

Lieut. Winslow is, so far as we are informed, the only person who has used tiles as spat collectors in our waters, but his experiments with them in Tangier Sound, in 1879, show that they can be employed in our waters with perfect success.

He used a collector which was made by lashing eight or sixteen tiles to a wooden frame. The frame rested upon the bottom, while the tiles themselves were raised about six inches.

The collector was sunk upon a natural bed by a rope, to the free end of which a floating buoy was attached to mark its position.

An apparatus of this sort was sunk by him in Big Annemessex River, in July 9, and on August 2, 348 young oysters were found upon one tile. On October 10, most of these had grown to a size of three-quarters of an inch.

We believe that any one will be convinced by the examination of his photographs of these tiles with the oysters upon them, which are here reproduced in Plates VIII, IX and X, that it is quite possible to increase our supply of oysters almost without limit by the use of similar means, and as we believe that these experiments should be more widely known among our people, and that they should be fully informed upon the subject, we quote Lieut. Winslow's account of his experiments, from his Report to the Superintendent of the United States Coast Survey.

INFORMATION OBTAINED FROM "SPAT COLLECTORS."

"In order to ascertain when the first attachment of young took place on each bed, the comparative extent of such attachment, the influence of bottom and depth of water upon the attachment, and, finally, the increase in size of the oyster and the number surviving each period of their existence, I placed early in July twenty-four spat collectors on the beds in the Sounds; but I regret to say that the collectors were removed by some ill-disposed persons almost as soon as placed."

"The last hurdle, as the bundle of tiles were called, was in position on July 14, and on July 15 only four remained in position, and after the 1st of August there was but one left (No. 7, in the Big Annemessex River.")

"The hurdles were composed of eight or sixteen half-round tiles, lashed on a wooden frame, and so arranged that the frame rested on the bottom, the tiles being thus raised about six inches above the bottom. The tiles were ordinary earthenware ones, unglazed, and were always placed so as to have their concave side underneath. As long as the hurdles remained in position they were frequently examined in order to ascertain the advent of the young brood, and from those examinations I am of the opinion that the first attachment of oysters took place about July 17, as on that day we discovered, with the aid of the microscope, oysters on Hurdle No. 12, on Chain Shoal, and on the 19th, in the same way, found them on No. 7, in the Big Annemessex. On July 24 they were observable on the hurdles on the Great Rock, both in shoal and deep water. Though the attachment probably began about the middle of July, yet it was only evident on the tiles, as our dredging operations did not discover any attachment before the 12th of August, when the young brood were found in moderate numbers on all the beds in both the Sounds."

"The number found in Pocomoke Sound was much smaller than in Tangier, and the number on the Upper Pocomoke beds and on the Muddy Marsh bed was smaller than on the lower ones. The attachment appears to be proportional to the number of oysters, such beds as the Muddy Marsh, for instance, having very few young; but as the bed is badly broken up, this may be owing to the absence of proper cultch. The young appear to select the cleanest and smoothest shells for attachment, and we always found that the "boxes," or those shells which had not been separated completely, contained the largest number of young brood. We also found that the size of the young depended, to a great extent, upon the depth of water. Those first detected by us were from two millimetres to one centi-

EXPLANATION OF PLATE VII.

Various methods which are employed in France for arranging the tiles which are used for collecting oyster spat. (From Coste's Report.)

FIGURE 1.—Tent collector.

FIGURE 2.—Single roof collector.

FIGURE 3.—Double roof collector.

FIGURE 4.— Tiles arranged in oblique, overlapping rows.

(We are indebted to Prof. S. F. Baird, Superintendent U. S. Fish Commission, for the use of the figures in this plate.)

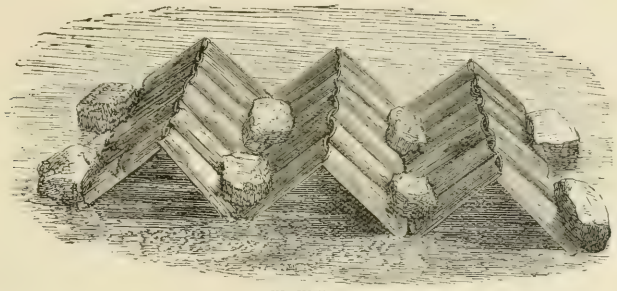


FIGURE 1.

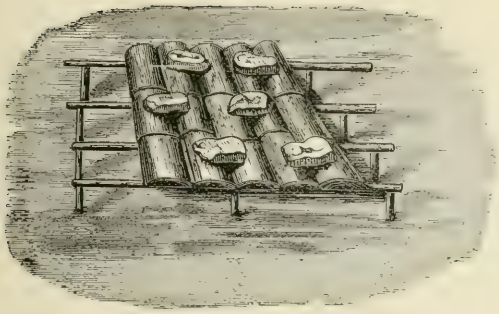


FIGURE 2.

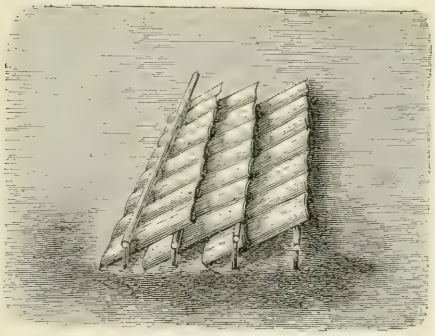


FIGURE 4.

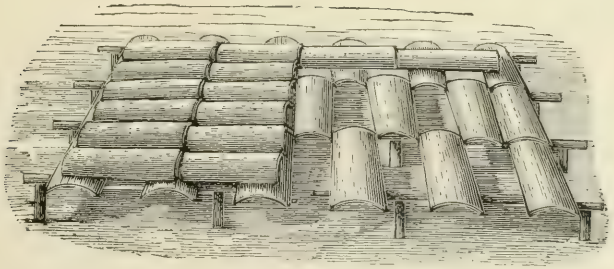


FIGURE 3.

EXPLANATION OF PLATES VIII, IX AND X.

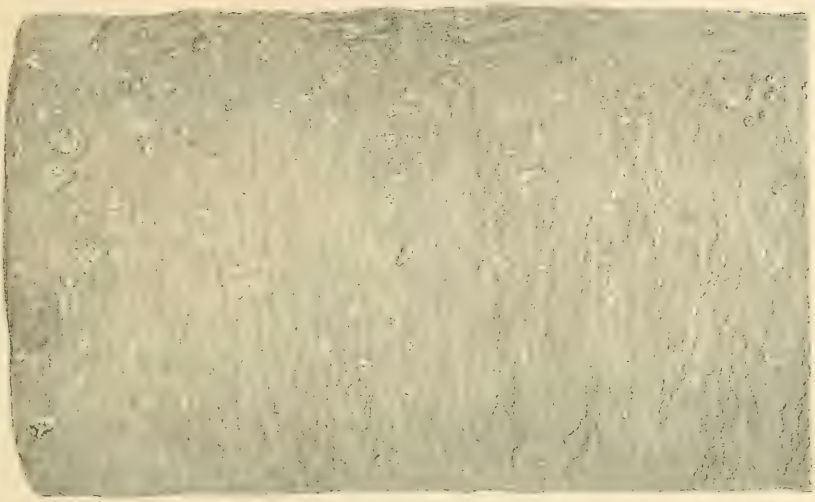
Tiles which were deposited in the Little Annamessex River by Lieut. Francis Winslow, U. S. N., on July 9th, 1879, for the attachment of spat.

PLATE VIII.—Upper and lower surfaces of a tile which was removed twenty-four days after it was placed in the water.

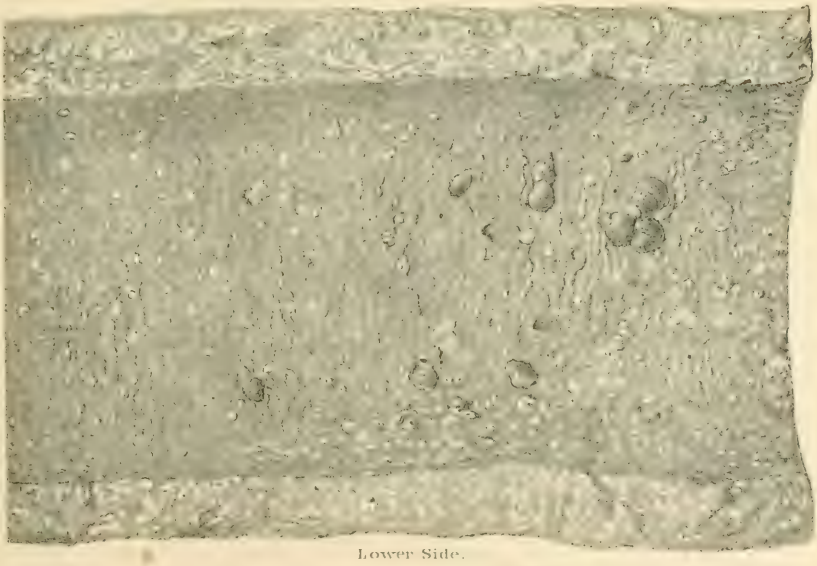
PLATE IX.—Upper and lower surfaces of a tile which was removed after it had been in the water for forty-five days.

PLATE X.—Upper and lower surfaces of a tile which was removed after it had been in the water for about three months.

TILE
Placed in position July 9th Removed August 2nd
Scale 2/3 Natural Size.



Upper Side.

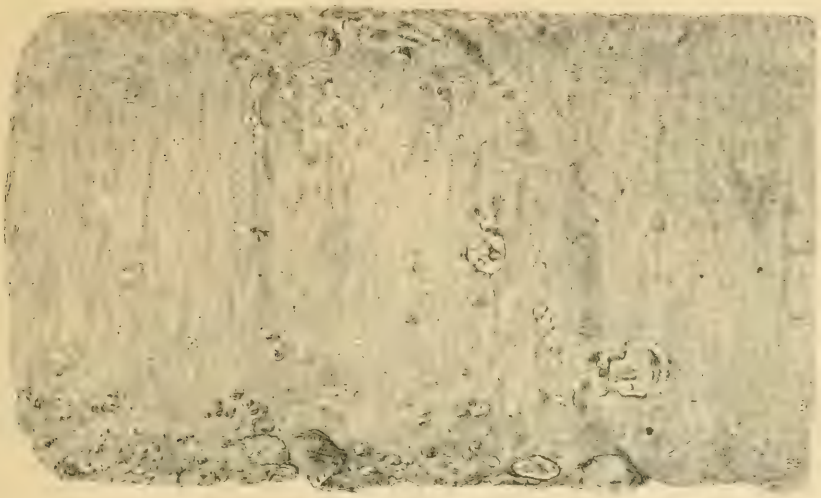


Lower Side.

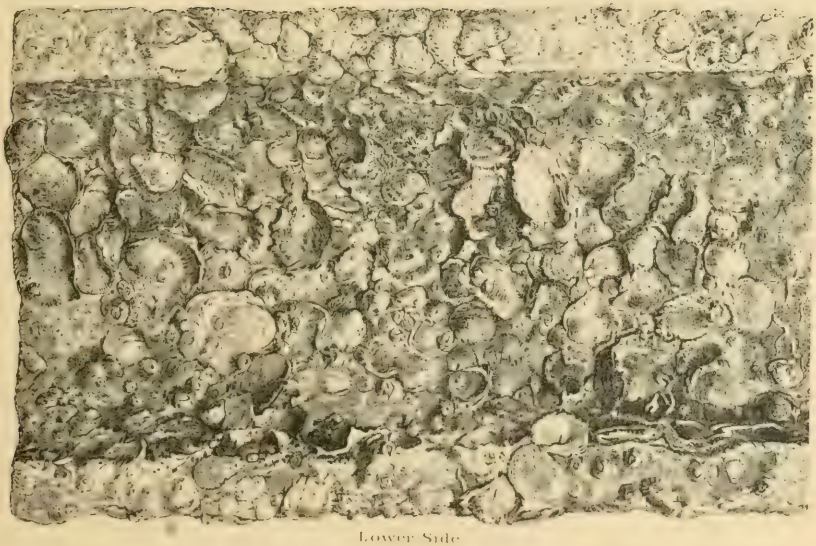
From Winslow's Report on the Oyster Beds of Tangier and Pocomoke Sounds.

J. Hoen & Co. Lithographers Baltimore

TILE
Placed in position July 9th Removed August 23rd
Scale 2/3 Natural Size.



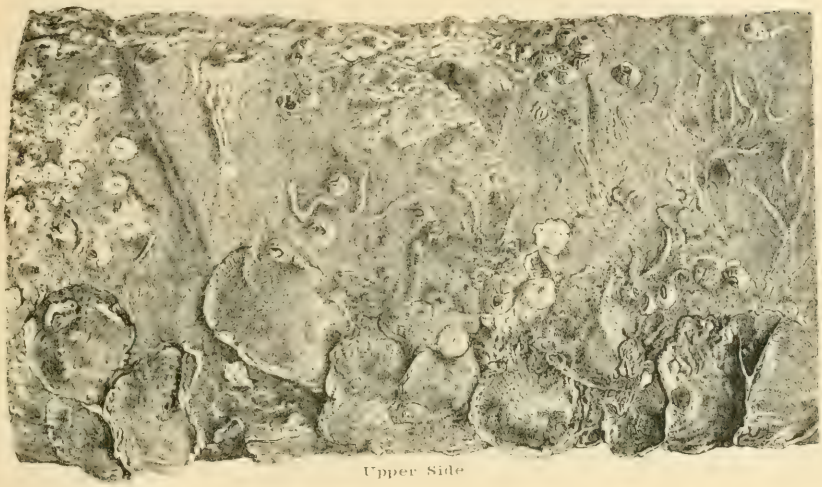
Upper Side



Lower Side

From Winslow's Report on the Oyster Beds of Tangier and Pocomoke Sounds.

TILE
Placed in position July 9th Removed October 10th
Scale 2-3 Natural Size.



Upper Side

Lower Side

From Winslow's Report on the Oyster Beds of Tangier and Pocomoke Sounds.

metre in length, and as the shoal-water oysters spawn first, and as we found the young of the largest size in shoal water, I infer that the attachment of the oyster occurs very near the location of the parent."

"The hurdle in the Big Annemessex was subjected to four examinations. It was placed in position on July 9, and on July 19, when the first examination was made, there were a few oysters on the tiles, but so small that a microscope was necessary in order to recognize them."

"The second examination was on August 2, and the oysters were then quite perceptible and easily counted. The total number of oysters on the tiles was then 1,506; deducting those on tile No. 7, which tile was removed, there were 1,777. The number on a tile varied greatly, the maximum being 348, and the minimum 26."

"The third examination was on the 23d of August. The oysters had increased very much in size and in numbers. The total number on the tiles was now 1,334, showing an increase of 0.13 per cent. of the number at the second examination. The number on the lower side of the tiles was much larger than on the upper. A tile (No. 2) was removed, and deducting the number of oysters on it from the sum, there were 1,202 still on the hurdle. A few oysters were injured, probably by raising or lowering the hurdle from and to the bottom."

"The fourth examination was on the 10th of October. The total number of oysters was then 539, showing a decrease of 55 per cent. At this examination about two-thirds of the oysters were of the third class, or over three-quarters of an inch in length, and two of them were over two inches long, being thus of the second class. All, however, could be distinguished as of very recent growth, being very long and thin, with thin, delicate shells, easily broken with the thumb-nail or point of a penknife. The largest numbers were still found on the lower sides of the tiles. A moderate number of oysters had been injured by rough handling."

"I infer from the four inspections made of this hurdle, and from the one or two made of others before they were removed, that the first attachment of young began, as I have said, about the middle of July, and continued until about the 20th of August, as on the 23d of that month there was no indication of any recent attachment. Probably it reaches its maximum number about the end of July, and decreases afterwards. The mortality after the 23d of August was very great, fully 50 per cent. perishing from some unknown cause, which, though unknown, is certainly natural. We did not notice any evidence of the destructive effects of drills or other animals, though their agency would only be discovered by the evidence of the holes in the upper valves, but as those valves were never present, it cannot be said with certainty that the destruction was not due to them. Whatever the cause, the fact is that 50 per cent. perished in the first six weeks of their existence."

"The tiles have shown that the increase in size is much greater than was supposed, and are the first and only authentic evidence upon that point which has been produced with regard to the American oyster. Again, it is conclusively shown by these tiles and some others that were dredged up from the Woman's Marsh beds (Hurdle No. 24), that the greatest attachment is on the lower concave side, and consequently that whatever may be the movements of the embryo oyster before attachment, during the period just prior to it they are near, if not on the bottom, and in seeking their place of attachment they must rise. In this they are similar to the European variety. The selection of the lower sides of the tiles and the interior of the 'boxes' may be an effort of nature to provide some protection for the young brood, by, to a certain extent, inducing them to seek dark and secluded points for attachment, or the large number found in such places may be due to the inability of the various enemies of the spat to get at them when thus protected."

"It is a matter of very great regret that we have not a large number of specimens and observations for comparison, as all the future investigations in this field would be greatly assisted by an accurate knowledge of the rate of decrease in number and increase in size of the oysters, and it is to be

hoped that the hurdle in the Big Annemessex will be allowed to remain in position long enough to permit the meagre, yet valuable, information it can produce to be made public."

SPAT COLLECTORS FOR MUDDY BOTTOMS.

Fascine Collector.—This consists of a bundle or fagot of small branches of chestnut, oak, elm, birch, or any other suitable wood, about ten or twelve feet long, bound together in the middle by a tarred, galvanized iron wire, which is fastened to a stone, by which the bundle is anchored about a foot above the bottom. These fascines are placed upon or near the beds of oysters at the spawning season, and distributed in places where the set of the tides and currents will carry the swimming oyster larve to them. The young oysters settle upon the branches in great numbers, and attaching themselves grow rapidly, and it is not unusual for one such fagot to yield several thousand. The bundles are left undisturbed for five or six months, and at the end of this time they are large enough to be detached from the branches, when they are ready for distribution upon the planting grounds. In Plate XI, figure 2, one of these bundles is shown, in place upon the oyster bed, and one of the branches, with the young oysters upon it, is shown on a larger scale in figure 1.

This method of collecting seed oysters has never, so far as I am aware, been employed in this country, although the experience of all who are familiar with our oyster waters must have shown how readily the young growth became attached to floating or sunken bushes. Our waters abound in places which are well-fitted for the employment of this method of gathering the seed which is to be used in planting, and the fascine collectors might be used in the mouths of creeks or inlets, or along the edges of the channels, or anywhere where the set of the current will sweep the swimming oysters past the collector. While it would be advantageous to place the collectors near natural beds or rocks, this is by no means essential, for the young of the American oyster survive for a long time in the water, and they are carried to great distances by the current, and there is no part of our oyster area beyond the reach of this floating spat.

The method may be employed on either hard or soft bottom, as the collectors float above the surface of the ground, but is especially adapted for bottoms too soft for planting, and such bottoms may in this way be made valuable as seed farms. The collectors may be placed in either deep or shallow water, wherever there is a current.

With the exception of Winslow's experiments with tiles, very little use has been made in America of anything, except oyster-shells, for collecting spat; but at one point in Connecticut a plan, which is essentially like the one last described, has been used with good results for capturing spat, and for rearing marketable oysters as well upon bottoms of soft mud.

These experiments are thus described in the reports of the Connecticut Shell Fish Commission for 1882 and 1883:

"The soft, muddy tracts, also, which aggregate a large number of acres now neglected, it is believed, will, at no far distant day, become valuable for cultivation."

"The efforts made to grow oysters on muddy bottoms in the Poquonock River, near Groton, to which reference was made in the last year's report, have been uniformly successful, as many as a thousand bushels of superior oysters having been obtained from one acre. No particular skill is required in carrying on similar experiments, and it is probable that the method will be generally followed throughout the State, where similar bottoms are found."

"Artificial methods for catching spawn have received little attention from Connecticut oyster growers, except in the case at Groton hereinafter mentioned. They are followed in a variety of ways in Europe; clean bushes and fagots are anchored or hung on chains in the vicinity of spawning beds, where the prevailing currents will carry the floating spawn to them. In this way immense quantities are caught and left to grow until ready for planting. Clean earthen tiles, made for the purpose, are also placed on and near the spawning grounds to catch the spat, and they serve better than anything else for this purpose.

Another method is that of raising a mound of rocks and gravel, about the time of spawning, and covering its surface with ripe brood oysters; around the mound are driven stout stakes or piles, close together, so that the floating spat cannot easily escape; being thus intercepted, spat adheres to the stakes and is there left until ready for planting."

"On the Poquonock River, near Groton, white birch bushes are stuck in the river mud, about spawning time, in fourteen or fifteen feet of water, at low tide. To these the spat adheres in great quantities. They are left undisturbed eighteen months, by which time the set becomes good-sized seed. On one bush, which was four inches through at the butt, twenty-five bushels of oysters were found, seven of which were large enough for market. The average yield is about five bushels to the bush. The grounds are so soft and muddy that no other method is feasible. About fifty acres are under this kind of cultivation, and the area is rapidly extending. The bushes are grappled out of the mud by derricks. The oysters are of excellent flavor, and the business is profitable."

Besides these simple but very effective devices for collecting spat, the French have invented a number of very complicated mechanical devices for use under peculiar circumstances.

The price of oysters in our State is not high enough to justify the practical use of any expensive machinery, but we give an account of two of these devices, as an acquaintance with them may enable our people to invent better or more practicable appliances for accomplishing the same purpose.

Two of them, the *Platform Collector* and the *Box Collector*, are thus described by Fraiche in his work on "Oyster Culture."

"PLATFORM COLLECTOR."

"This collecting apparatus is susceptible of all manner of modifications as to form and size to adapt it to the character of the ground upon which the bed is located. Not only is it easily made, arranged and handled, since one person can perform all the labor necessary, but it also does no injury whatever to the oysters which it covers. It is generally placed in position one or two weeks before the spawning period, and during its stay over the bed it preserves the oysters from all deposits of mud. When it is charged with a young growth it can be taken down in a short time and transported to any required distance, leaving the bank which it had covered not only in its primitive condition, so far as the original stock is concerned, but moreover enriched by a large number of germs, which, had it not been for the presence of the collector over the bed, would have been carried away, at least in great part, by the tidal currents, and thus lost. The platform collector consists (Plate XII, figure 4) of rows of posts arranged in pairs (A), each pair being fastened together, with an intervening space of 12 to 15 centimetres (4 to 5 inches), and planted in the ground over the entire area of the bed at a distance apart of about 2 meters, with each pair occupying one of the angles of a square, so that the surface covered is divided up into blocks, much like the surface of a chess-board. Each set of posts is pierced through by two sets of holes, the first at one-half meter and the second at .75 to .80 of a meter from the bottom; bars of wood or iron are passed through these holes, thus making each pair a sort of ladder with two rounds. Upon the lower rounds, from post to post, are laid bed-pieces or stringers (B), which should be quite strong, and which together constitute a frame-work of contiguous squares, upon which a platform of rough planks (D) is built and maintained in position by a second series of stringers (C), held down by the upper round (J) of the posts; the pressure upon the planks is regulated, when necessary, by means of beveled wooden blocks (Q. Q')."

"It will be readily seen that, by the aid of these stringers and rounds, nothing can be easier than the mounting and dismounting of the planks, either to change or turn them, or transport them elsewhere. Whenever desired the stringers and posts can be so arranged as to leave free spaces (E) as passages to facilitate the working of the platform. The planks should be of pine or fir, and from 2.10 to 2.15 meters (6 to 7 feet) in length, by .20 to .25 of a meter in breadth (8 to 10 inches), and .04 of a meter (about 1½ inches) in thickness."

"In order to facilitate the adherence of the spawn, planks with a rough surface are used, and the rougher the surface, as by gouging it out so as to increase its irregularities, the more easily can the young oyster adhere to it. The sides of the planks can also be covered with a layer of pitch and tar, in which, while it is yet soft, valves of oysters, mussels, or any other shells, which occur abundantly along the shore, or bits of coral, or small stones about the size of a nut, can be placed, so as to form a sort of artificial rock formation, favoring very much, by the roughened surface and the multiplication of points of attachment, the deposition and development of the young animals. This is much preferable to the other method, since it preserves the planks from the action of the water and the destructive borings of certain worms and mollusks. In order to afford a still greater number of points of attachment for the young germs, the lower face of the planks is covered with fascines of chestnut, oak or other wood, which are held close to the planks by means of cords passing through holes in the planks, and fastened upon the upper side (see Fig 4). Upon sandy or muddy bottoms the posts which support the stringers can be set without difficulty; but when the bottom is rocky or too hard they cannot be employed. They should then be replaced by blocks of stone, G (Fig. 4), about .70 of a meter in height by .25 of a meter in breadth and thickness, pierced through by a hole of sufficient size to receive the ends of the stringers, which are fastened there by means of a small block (H) driven in upon the upper side. These blocks can then be simply placed upon the bottom or fastened there with iron clamps; or the wooden stakes can be employed by fixing their lower ends into blocks of stone which, when in place, should be large enough to give steadiness to the collector and maintain it in its right position. This form of collector, it is true, is costly to establish, and more so from the fact that on account of the long time it must stay in the water it is necessary to select firm, solid wood, of good quality, but in its adjustment there is no need of any particular nicety of workmanship or finish, and there is, moreover, this advantage, that it lasts a long time, and can be used for several harvests. However, in those waters where boring worms and mollusks occur, a single season will render the platforms unfit for further service. In this case galvanized iron supports can be used in place of the wooden frame-work, and the planks may be replaced by sheets of metal having the two faces covered, as already described, with a mixture of pitch and tar, in which valves of shells, bits of coral or small stones have been imbedded. The metallic sheet, which forms the body of these pitch planks, will give sufficient solidity to the structure, and the supports can be in the form of a frame-work, capable of holding at least three sheets, which can be fastened in position by means of bolts; the entire structure may be arranged like a table upon four or eight legs, which can be driven into the ground, or fastened into blocks of stone, which will give the desired stability to the whole. These tables can be placed in rows according to the configuration of the bed, leaving passages between each two rows to facilitate working them. After the spat or germs have been collected upon the planks of the platform they can be easily transported either by sea or land. If by sea the planks are taken from the stringers and suspended lengthwise and vertically in a frame-work provided with floats, or arranged in the direction of the current, like the series of shelves, about one-fourth of a meter apart, and thus kept constantly in the water; in this shape they can be towed without trouble to any distance. When they are transported by land the planks are either carried in tanks full of sea-water, or placed between layers of wet sea-grass, and when so managed the young oyster can sustain, without serious damage, a journey of one or two days. When their destination is reached the young oysters are detached from the planks without trouble, as this operation demands only a slight amount of skill and attention, and deposited in the places to be stocked; or the planks may be placed upon supports similar to those whence they were taken, and the young oysters allowed to continue their development protected from the mud, and in such a position that by turning the planks the conditions of light and areation can be varied to suit the wants or requirements of the growing brood."

"BOX COLLECTOR."

"This apparatus unites the double advantage of presenting in a relatively small compass the greatest possible extent of surface for the attachment of germs, and at the same time the most favorable condi-

tions for the transportation and ultimate development of the young, in the movable and independent parts which compose it. It consists, essentially (Plate XIII, fig. 1), of a rectangular box, 2 meters in length by 1 meter in breadth and height, and is without any bottom. It is formed of planks (O) placed from 2 to 3 centimeters apart, or pierced with holes, for the entrance and circulation of water in the interior. These planks are permanently maintained in place upon the front and back sides by two cleats (R R), extending below the edge of the box, and are nailed to tranverse pieces which pass across the bottom from side to side. The ends are pierced by three sets of holes to accommodate the tranverse bars (S), upon which in the interior are placed movable frames, dividing the box into superimposed compartments. The cover is formed of thinner planks (D), placed side by side, and maintained in position by the bar (T), which slides into the two sockets (A), at the ends of the two stakes supporting the ends of the box. It is hardly necessary to add that the apparatus should be constructed of solid planks of a durable wood, such as oak, and that the fastenings of the parts should be so far as possible, of the same kind of wood, employing neither iron nor nails; but if their use is absolutely necessary, then the preference should be given to iron or galvanized nails. The frames for the inside are of wood, about four centimeters in thickness, and furnished with two handles to facilitate removing. The bottom is covered with brass wire netting (Plate V, figure 7), the meshes of which are about two centimeters upon a side, and in order to increase the strength of the frame and sustain the netting, diagonal wires can be run across from corner to corner or a central bar of wood from side to side. These frames are made of such a size that when placed side by side two of them will form a continuous flooring or division across the box, as shown in Plate XIII, figure 2, where the front portion of the box has been removed so as to show the arrangement of the interior. It is necessary, however, to give sufficient play to the frames, so that they can be moved at any instant, without trouble and without shaking. We herewith give the conditions in which this apparatus is used and the method of operation."

"The box collector is especially valuable when the oyster culturist has no natural bed near at hand whence to gather germs, and yet wishes to procure a large number of young to rapidly stock a park or live-pond. For he can always, just before the spawning season, have several hundred oysters brought from the bed nearest his basin, since oysters, when they have attained a certain size, will sustain transportation for several days without damage, provided the precaution is taken to furnish them with water now and then. Once in possession of these oysters, in a good location, where the water is calm without being stagnant, the bottom pebbly and properly protected from mud, and the light and depth suitable—or even in an artificial basin of from 1 to 1½ metres in depth, which communicates with the sea at each tide—the box is placed upon the bottom in such a manner that the lower transverse pieces rest upon stones and the entire lower side is off the ground, enabling a free circulation of water. Four stakes, P P, figure 1, are then driven into the ground, one along the middle of each face of the box, so as to prevent any swaying or change of position, by the action of the waves and currents, and maintain the apparatus in the same position. The cover is then removed, and sixty mother oysters are deposited upon that portion of the soil circumscribed by the box, care being taken, if the soil is soft or muddy, to cover it previously with empty shells, so that the oyster, when placed there, may not become covered up, but always remain in pure water. This done, the two lower stringers, S S, are placed in position, and upon them two frames (figure 7) are arranged, which are treated the same as the bottom; that is, a layer of shells is first placed upon them, and then a certain number of mother oysters above and over the shells. The second set of stringers is then placed in position, the frame arranged as before, and the oysters distributed over them, and, finally, the third set of stringers and frames are arranged and covered with shells (figure 2), but no oysters are placed upon them. The cover is then placed upon the box and fastened down by means of the top bar and the wedges, C, which fasten the ends of the bar in the sockets of the end posts, and render the whole apparatus solid and immovable. The apparatus being thus prepared, it is easy to conjecture the result. The oysters, under such excellent conditions of existence and in such pure and quiet water, soon spawn; the young growth, finding itself imprisoned, or nearly so, in the various com-

partments of the box, and coming upon suitable places of attachment near at hand, remain in the box and dispose themselves nearly everywhere, but from preference upon the shells covering the frames, and proceed in their development under the best possible condition and protected from all danger. In from five to six months the young oysters have attained such a size that they can be removed without danger. The apparatus is then taken apart, piece by piece, commencing with the cover, and as each tray is removed its contents are deposited upon the bottom of a park, live-pond, claire, or such place as one wishes to restock or supply. If it is desired to carry them to a distance, the trays can be placed in a floating box, pierced with holes, and if arranged in layers, like shelves, and with sea-weed packed between them, so as to prevent the disturbance and shaking incident to movement in the water, they can be towed for long distances without danger of injuring the shells of the young oysters or detaching them from their supports. And if the trays are packed in boxes, with wet sea-weed between them, they can be transported by land very nicely. For one who has limited means at his disposal, and when labor and expense is an important consideration, the box collector ought by all means to be given the preference; by the ingenious method of multiplying surfaces, which is its distinctive features, innumerable germs can be hatched out in a very restricted space. A small case of a few square metres in area, a small artificial basin which can be filled at each tide, and a narrow passage-way between two rocks, is amply sufficient for the production of the thousands of germs necessary for the stocking of a live-pond, or even a larger inclosure; for the possibility of placing two or more of these boxes close together without injury to the oysters or the germs which they contain, permits a response to all the demands of the breeder, however restricted or extended they may be. Moreover, the apparatus itself, besides being easy to manage, arrange and transport, will last for several years, if suitable wood is used in its construction, and if the outside at least is protected in some such manner as are the bottoms of vessels, by a sort of sheathing. As to the inside, as well as the cross-pieces and the wooden parts of the trays, they can be covered with the mixture of tar and pitch already mentioned, and incrusted with shells and stones, which will not only preserve them from rapid decay, but also render them suitable places of attachment for the young oysters."

ON THE REARING OF OYSTERS FROM ARTIFICIALLY FERTILIZED EGGS.

If all the spat which attaches itself could be secured and preserved, there would be an immediate and rapid increase in the supply, and the account which we have just given shows that it is perfectly possible for our people to do this, as it has already been accomplished in France and in Connecticut; but even when all this is done there will still be an enormous waste of oysters.

Each oyster lays millions of eggs, which soon hatch into very minute and delicate embryos, and the greatest mortality occurs at this time in the life of the animal, and thousands of the swimming embryos perish by accidents of various kinds for each one which attaches itself.

We come now to one of the most interesting aspects of the oyster question, and we propose to point out that it is perfectly possible to fertilize the oyster eggs artificially and to nurse the young through this very dangerous period of infancy by artificial means. We also propose to show that Americans have borne a prominent part in this discovery, as we have already shown that they have done in the development of oyster farming.

Previously to 1879 nothing was known regarding the breeding habits of the American oyster, and all our knowledge was based upon the statements of a few naturalists, who had studied the oysters of Northern Europe.

It was believed from these statements that all oysters are hermaphrodite; that the eggs are fertilized inside the body of the parent, and that they pass through their early stages of development while sheltered and protected within the shell of the mother, and that the rearing of oysters by artificially fertilizing the eggs, as is done with fishes, is, therefore, impossible.

In 1879 one of your commissioners showed that this is not true of the American oyster; that the

sexes are separate; that the eggs are fertilized outside the body; that the young are independent of parental protection, and that they can be reared artificially in enormous numbers.

These discoveries, which prove the possibility of rearing oysters artificially' were published in the report of the Maryland Fish Commission for 188[illegible], and Ingersoll, in his "Report on the Oyster Industry of the United States," gives a condensed popular summary of this paper, which is here reproduced.

"*Reproduction and embryology.*—An account of the life-history of the oyster should begin with the beginning—the egg—out of which this mollusk, like everything else from mussel to man, is born. And in this matter of oyster-breeding I must rely upon and again quote at length the researches of Dr. Brooks, since he is easily in advance of all students in his knowledge of this subject. During the summer of 1880, at his seaside laboratory, Crisfield, Maryland, and subsequently Dr. Brooks made microscopic studies on the embryology of the oyster, which were published, with figures, in the Report of the Maryland Fisheries Commission for 1880, and in the memoirs of the Johns Hopkins University. These investigations were of the most painstaking description, and may be accepted as satisfactorily portraying the true method of reproduction of the American oyster, *Ostrea virginiana*, although showing it to be essentially different from that of the oyster of Europe, *Ostrea edulis*. It is my duty as well as pleasure, consequently, to set forth with as great accuracy as condensation and a popular treatment of the subject will permit the statement of Dr. Brooks."

"If several oysters are opened during the breeding-season, which varies, as will hereafter be shown, a few will be found with the reproductive organ greatly distended and of a uniform opaque white color. These are oysters which are spawning or ready to spawn, that is, to discharge their eggs. Sometimes the ovaries will be so gorged that the ripe eggs will ooze from the openings of the oviducts before the mass is quite at the point of being discharged. If the point of a knife be pushed into the swollen ovary, a milk-white fluid will flow out of the cut. Mixing a little of this with sea-water and placing it on a slide underneath a cover, a lens of 100 diameters will show, if the specimen is a female, "that the white fluid is almost entirely made up of irregular, pear-shaped, ovarian eggs, each of which contains a large, circular, transparent germinative vesicle, surrounded by a layer of a granular, slightly opaque yolk.' Perfectly ripe eggs will be seen to be clean, sharply defined and separate from each other. If the specimen be male, a glance through the microscope shows something quite different from the fluid of a female. 'There are no large bodies like the eggs, but the fluid is filled with innumerable numbers of minute granules, which are so small that they are barely visible when magnified one hundred diameters. They are not uniformly distributed, but are much more numerous at some points than at others, and for this reason the fluid has a cloudy or curdled appearance. By selecting a place where the granules are few and pretty well scattered, very careful watching will show that each of them has a lively dancing motion, and examination with a power of 500 diameters will show that each of them is tadpole-shaped, and consists of a small, oval, sharply defined 'head,' and a long, delicate 'tail,' by the lashing of which the dancing is produced.' These are the *spermatozoa*, or 'male cells,' whose union with the eggs or *ova* of the female is necessary to the fertilization of the latter, and the consequent hatching of living oysters."

"Again quoting from Dr. Brooks:"

"The number of male cells which a single male will yield is great beyond all power of expression, but the number of eggs which an average female will furnish may be estimated with sufficient exactness. A single ripe egg measures about one five-hundredths of an inch in diameter, or five hundred laid in a row, touching each other, would make one inch; and a square inch would contain five hundred such rows, or 500 by 500=250,000 eggs. Nearly all the eggs of a perfectly ripe female may be washed out of the ovary into a beaker of sea-water, and as they are heavier than the sea-water, they soon sink to the bottom, and the eggs of a medium-sized female will cover the bottom of a beaker two inches in diameter with a layer of eggs one-twentieth of an inch deep. The area of the bottom of a beaker two inches in diameter is a little more than three square inches, and a layer of eggs one-twentieth of an inch deep, covering three square inches, is equal to one three-twentieths of an inch deep and two square, and as a

single layer of eggs is one five hundredths of an inch thick, a layer of three-twentieths of an inch thick will contain seventy-five layers of eggs, with 250,000 eggs in each layer, or 18,750,000 eggs. It is difficult to get the eggs perfectly pure, and if we allow one-half for foreign matter and errors of measurement, and for imperfect contact between the eggs, we shall have more than nine millions as the number of eggs laid by an oyster of average size, a number which is probably less than the true number."

"Möbius estimates the number of eggs laid by an average European oyster at 1,012,925, or only one-ninth the number laid by an ordinary American oyster, but the American oyster is very much larger than the European, while its eggs are less than one-third as large, so the want of agreement between these estimates does not indicate that either of them is correct.* Another estimate of the number of eggs laid by the European oyster is given by Eyton (*History of the Oyster and Oyster Fisheries*, by T. C. Eyton, London, 1858). He says, page 24, that there are about 1,800,000, and therefore agrees pretty closely with Möbius."

"An unusually large American oyster will yield nearly a cubic inch of eggs, and if these were all in absolute contact with each other, and there were no portions of the ovaries or other organs mixed with them, the cubic inch would contain 500^3, or 125,000,000. Dividing this, as before, by two, to allow for foreign matter, interspaces and errors of measurement, we have about 60,000,000 as the possible number of eggs from a single oyster."

"Although each male contains enough fluid to fertilize the eggs of several females, there does not seem to be much difference in the number of individuals of the two sexes. When a dozen oysters are opened and examined, there may be five or six ripe females and no males, but in another case a dozen oysters may furnish several ripe males, but no females, and in the long run the sexes seem to be about equally numerous. Oystermen believe that the male may be distinguished from the female by certain characteristics, such as the presence of black pigment in the mantle, but microscopic examination shows that these marks have no such meaning, and that there are no differences between the sexes except the microscopic ones. It is not necessary to use the microscope in every case, however, for a little experience will enable a sharp observer to recognize a ripe female without the microscope. If a little of the milky fluid from the ovary of a female with ripe or nearly ripe eggs, be taken upon the point of a clean, bright knife-blade, and allowed to flow over it in a thin film, a sharp eye can barely detect the eggs as white dots, while the male fluid appears perfectly homogeneous under the same circumstances, as do the contents of the ovary of an immature female, or one which has finished spawning. When the eggs are mixed with a drop of water, they can be diffused through it without difficulty, while the male fluid is more adhesive and difficult to mix with water. By these indications, I was able, in nearly every case, to judge of the sex of the oyster before I had made use of the microscope."

"*Sexual Differences.*—This question of sex, and the condition under which impregnation takes place in oysters, must next be considered. To this question Dr. Brooks devoted himself with special attention."

"About all the published information upon the subject referred to the European species, and stated that, by means of spermatozoa, discharged into the water by neighboring oysters, and sucked within the shell, the eggs are fertilized inside the body of the parent, and that the young are carried inside the parent shell until they are quite well advanced in development and provided with shells of their own; that they swim about after they are discharged from the parent until they find a place to attach themselves, but that they undergo no change of structure between the time when they leave the parent and the time when they become fixed. Misled by these statements, Dr. Brooks opened many oysters during the summer of 1878, and carefully examined the contents of the gills and mantle chambers, but found no young oysters. 'I concluded,' he says, 'that the time during which the young are carried by the parent must be so short that I missed it, and I entered upon the work this season with the determination to examine adult oysters

"*Möbius' measurement, from 0.15 to 0.18 millimeters, is given (Austern und Austern-wirtschaft, 1877) as the diameter not of the egg, but of the embryo, but his figures show that the European oyster, like the American, does not grow much during the early stages of development, but remains about the same size as the egg."

EXPLANATION OF PLATE XI.

FIGURE 1.—A bundle of branches anchored over the spawning oysters, to furnish attachment for the spat.

FIGURE 2.—A fragment of one of these branches, natural size, covered with young oysters.

(We are indebted to Prof. S. F. Baird for the use of cuts of these figures, which are copied from Coste's Report.)

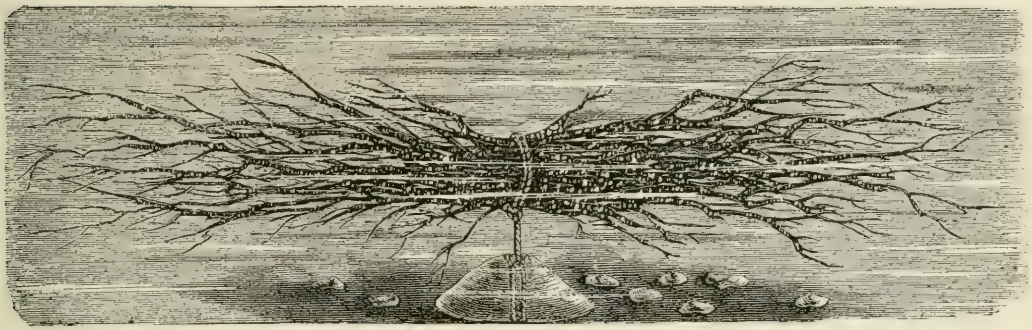


FIGURE 2.

FIGURE 1.

every day, through the breeding season, in search of young, and at the same time to try to raise the young for myself by artificially fertilizing the eggs after I had removed them from the body of the parent.' The result of a diligent practice of the first of these resolutions surprised him. In the first place he proved anew the generally disputed doctrine that oysters are not hermaphroditic; in other words, that each oyster is, at the breeding season, either a male or a female." He writes:

"'During my investigations I submitted more than a thousand oysters to microscopic examination. My studies were carried on during the breeding season, and I did not find a single hermaphrodite. The male cells are so small compared with the eggs, that it would be impossible to state that a mass of eggs taken from the ovary contained no spermatozoa, although they could not escape detection if they were at all abundant.'"

"On the other hand, a single egg in the field of the microscope, in a drop of male fluid, would be very conspicuous, and could not escape detection; and the fact that not a single case of this kind occurred, is sufficient to establish the distinctness of the sexes at the breeding season."

"Further than this, he discovered that although the American oyster seems well adapted to follow the European species, and various other marine and fresh water Lamellibranchs, to draw into its mantle chamber, with the sea water, the spermatozoa discharged from the mantle chambers of neighboring oysters, and thus to bring about the fertilization of the egg inside the cavity of the shell, this does not seem to occur. He affirms this very positively, and scientific men generally have accepted the conclusions as facts. I quote the words of one paragraph relating to it:

"'I have carefully searched the gills and mantles of more than a thousand oysters, at a time when the reproductive organs were plainly seen to be discharging their ripe contents, and have not found a single fertilized egg or embryo in any part of the mantle chamber, in or on the gills, or anywhere else inside the shell. This negative evidence, together with the fact that the eggs can be hatched after they have been artificially removed from the ovaries, seem sufficient to prove, in the absence of all evidence to the contrary, that the eggs of the American oyster undergo development in the open ocean.'"*

"That is to say, during all the period when the young of the European oyster is being safely nurtured inside the mantle-cavity of its parent, and protected from all harm by its strong shells, our infant oysters swim at large in open ocean—if lucky enough to get himself born at all from the egg which is sent abroad unfertilized, to meet a chance male cell and so become impregnated and start into life, if fortune favors."

"*Experiments in artificial fertilization.*—As has been hinted, Dr. Brooks spent much of his time and efforts at the laboratory in experimenting upon the artificial fertilization of oysters, by mixing eggs extracted from a female with spermatozoa from a male. He found it an easy matter to secure their union, and made his embryological studies from eggs and embryos thus cultivated, in a watch crystal or in a glass beaker. He gives minute directions as to the proper method for repeating these experiments, which those having a microscope can easily undertake, but which may be omitted as not pertinent here."

"*Development of the young oyster.*—The next step, having got the eggs, or learned their nature, is to examine their fertilization and development. Dr. Brooks writes:"

"The body of the oyster, like that of all animals, except the very simplest, is made up of organs, such as the heart, digestive organs, gills and reproductive organs, and these organs are at some period in the life of the oyster made up of microscopic cells. Each of these consists of a layer of protoplasm around a central nucleus, which, in the egg, is a large, circular, transparent body, known as the germinative

*"Writing concerning his work in 1881, Mr. John A. Ryder remarks: 'No evidence to show that our oyster is hermaphrodite was found during the entire season, nor were my searches for embryo or eggs, in the mantle or in the gills, more successful than those carried on two years before by Professor Brooks. There is no doubt whatever that the oyster of Europe nurses its young on its mantle or gills for some time, nor can we well question the very high authority of Möbius for saying that in most cases the sexes are separate, and that only one kind of products, viz.: either eggs or spermatozoa, are at any time found in the generative organs. Lacaze Duthier's observations seem to confirm the conclusions of Möbius.'—*Report of T. B. Ferguson, a commissioner of fisheries of Maryland, January*, 1881, *page* 14."

vesicle. Each cell of the body is able to absorb food, to grow and to multiply by division, and thus to contribute to the growth of the organ of which it forms a part. The ovarian eggs are simply the cells of an organ of the body, the ovary, and they differ from the ordinary cells only in being much larger and more distinct from each other; and they have the power, when detached from the body, of growing and dividing up into cells, which shall shape themselves into a new organism like that from whose body the egg came. Most of the steps in this wonderful process may be watched under the microscope, and owing to the ease with which the eggs of the oyster may be obtained, this is a very good egg to study."

"About fifteen minutes after the eggs are fertilized they will be found to be covered with male cells. In about an hour the egg will be found to have changed its shape and appearance. It is now nearly spherical, and the germinative vesicle is no longer visible. The male cells may or may not still be visible upon the outer surface. In a short time a little transparent point makes its appearance on the surface of the egg, increases in size, and soon forms a little projecting transparent knob—the *polar globule.*

"Recent investigations tend to show that while these changes are taking place one of the male cells penetrates the protoplasm of the egg and unites with the germinative vesicle, which does not disappear, but divides into two parts, one of which is pushed out of the egg and becomes the polar globule, while the other remains behind and becomes the nucleus of the developing egg, but changes its appearance so that it is no longer conspicuous. The egg now becomes pear-shaped, with the polar globule at the broad end of the pear, and this end soon divides into two parts, so that the egg is now made of one large mass and two slightly smaller ones, with the polar globule between them."

"The later history of the egg shows that at this early stage the egg is not perfectly homogeneous, but that the protoplasm which is to give rise to certain organs of the body has separated from that which is to give rise to others."

"If the egg were spilt vertically we should have what is to become one-half of the body in one part and the other half in the other. The single spherule at the small end of the pear is to give rise to the cells of the digestive tract of the adult, and to those organs which are to be derived from it, while the two spheres at the small end are to form the cells of the outer wall of the body and the organs which are derived from it, such as the gills, the lips and the mantle, and they are also to give rise to the shell. The upper portion of the egg is to become the ventral surface of the adult oyster, and the surface which is on the right side is to become the anterior end of the body of the adult. The upper portion of the egg soon divides up into smaller and smaller spherules until we have a layer of small cells wrapped around the greater part of the surface of a single large spherule. This spherule now divides up into a layer of cells, and at the same time the egg, or rather the embryo, becomes flattened from above downward, and assumes the shape of a flat oval disk. In a sectional view it is seen to be made up of two layers of cells; an upper layer of small transparent cells, which are to form the outer wall of the body, and which have been formed by the division of the spherules which occupy the upper end of the egg, and a lower layer of much larger, more opaque cells, which are to become the walls of the stomach, and which have been formed by the division of the large spherule."

"This layer is seen in the section to be pushed in a little toward the upper layer, so that the lower surface of the disk-shaped embryo is not flat, but very slightly concave. This concavity is destined to grow deeper until its edges almost meet, and it is the rudimentary digestive cavity. A very short time after this stage has been reached, and usually within from two to four hours after the eggs were fertilized, the embryo undergoes a great change of shape."

"A circular tuft of long hairs, or cilia, has now made its appearance at what is thus marked as the anterior end of the body, and as soon as these hairs are formed they begin to swing backward and

forward in such a way as to constitute a swimming organ, which rows the little animal up from the bottom to the surface of the water, where it swims around very actively by the aid of its cilia. This stage of development, which is of short duration, is of great importance in rearing the young oysters, for it is the time when they can best be siphoned off into a separate vessel and freed from the danger of being killed by the decay of any eggs which may fail to develop. On one surface of the body at this stage, the dorsal surface, there is a well-marked groove, and when a specimen is found in a proper position for examination, the opening into the digestive tract is found at the bottom of this groove. Figure 33 is a sectional view of such an embryo. It is seen to consist of a central cavity, the digestive cavity, which opens externally on the dorsal surface of the body by a small orifice, the primitive mouth, and which is surrounded at all points, except at the mouth, by a wall which is distinct from the outer wall of the body. Around the primitive mouth these two layers are continuous with each other."

"This stage of development, in which the embryo consists of two layers, an inner layer surrounding a cavity which opens externally by a mouth-like opening, and an outer layer which is continuous with the inner around the margins of the opening, is of very frequent occurrence, and it has been found, with modifications, in the most widely separated groups of animals, such as the starfish, the oyster, and the frog, and some representatives of all the larger groups of animals, except the *Protozoa* appear to pass during their development through a form which may be regarded as a more or less considerable modification of that presented by our oyster-embryo. This stage of development is known as the *gastrula* stage."

"Certain full-grown animals, such as the fresh-water hydra and some sponges, are little more than modified gastrulas. The body is a simple vase, with an opening at one end communicating with a digestive cavity, the wall of which is formed by a layer of cells, which is continuous around the opening with a second layer, which forms the outer wall of the body. This fact, together with the fact that animals of the most widely separated groups pass through a gastrula stage of development, has led certain naturalists to a generalization, which is known as the 'gastrula theory.' This theory or hypothesis is that all animals, except the *protozoa* are more or less direct descendants of one common but very remote ancestral form, whose body consisted of a simple two-walled vase, with a central digestive cavity opening externally at one end of the body."

"The edges of the primitive mouth of the oyster continue to approach each other, and finally meet and unite, thus closing up the opening and leaving the digestive tract without any communication with the outside of the body, and entirely surrounded by the outer layer. The furrow in which the primitive mouth was placed still persists, and soon a small irregular plate makes its appearance at each end of it. These little plates are the two valves of the shell, and in the oyster they are separated from each other from the first, and make their appearance independently."

"Soon after they make their appearance the embryos cease to crowd to the surface of the water, and sink to various depths, although they continue to swim actively in all directions, and may still be found occasionally close to the surface. The region of the body which carries the cilia now becomes sharply defined, as a circular projecting pad, the *velum*, and this is present and is the organ of locomotion at a much later stage of development."

"The two shells grow rapidly and soon become quite regular in outline, but for some time they are much smaller than the body, which projects from between their edges, around their whole circumference, except along a short area, the area of the hinge, upon the dorsal surface, where the two valves are in contact."

"The two shells continue to grow at their edges, and soon become large enough to cover up and project a little beyond the surface of the body, and at the same time muscular fibres make their appearance and are so arranged that they can draw the edge of the body and the velum in between

the edges of the shell. In this way that surface of the body which lines the shell becomes converted into the two lobes of the mantle, and between them a mantle cavity is formed, into which the velum can be drawn when the animal is at rest. While these changes have been going on over the outer surface of the body, other important internal modifications have taken place."

"We left the digestive tract without any communication with the exterior. Soon the outer wall of the body becomes pushed inward, to form the true mouth. The digestive cavity now becomes greatly enlarged, and cilia make their appearance upon its walls, the mouth becomes connected with the chamber which is thus formed, and which becomes the stomach, and minute particles of food are drawn in by the cilia, and can now be seen inside the stomach, where the vibration of the cilia keep them in constant motion. Up to this time the animal has developed without growing, and is scarcely larger than the unfertilized egg, but it now begins to increase in size."

"Soon after the mouth has become connected with the stomach this becomes united to the body-wall at another point a little behind the mouth, and a second opening, the *anus*, is formed. The tract which connects the anus with the stomach lengthens and forms the intestine, and, soon after, the sides of the stomach become folded off to form the two halves of the liver, and various muscular fibers now make their appearance within the body."

"All my attempts to get later stages than these have failed, through my inability to find any way to change the water without losing the young oyster, and I am therefore unable to describe the manner in which the swimming embryo becomes converted into the adult, but I hope that this gap will be filled, either by future observations of my own or by those of some other embryologist."

"Such is the scientific history of the oyster-embryo. The practical utility of the knowledge, however, to the most of us, is that the American oyster lays a vast number of eggs, but that they are exposed to dangers so constant and innumerable, that under ordinary conditions few ever come to life, or at any rate succeed in living long enough to anchor themselves and take on the protection of shells. This is only another example of a fact well-known to naturalists, and occurring widely among animals of low grade. The number of eggs laid, or even of individuals born, has very little to do with the abundance of a species, which is 'determined, mainly, by the external conditions to which it is exposed.'"

"*Life of the Young Oyster.*—The young American oyster leads a peculiarly precarious time, since it is first thrown out an unfertilized egg, and the chance that it will immediately meet with a male cell must be very slight; yet if it does not it will perish, for the sea-water destroys unimpregnated eggs within a few minutes after contact with it. Having by good chance become fertilized by meeting a male cell, the next period of great danger is the short time during which the embryos swarm to the surface of the water. They are so perfectly defenseless, and so crowded together close to the surface, that a small fish, swimming along with open mouth, might easily swallow, in a few mouthfuls, a number equal to a year's catch. They are also exposed to the weather, and Dr. Brooks found that a sudden cold wind or fall in temperature, as occurred several times during his experiments, killed every embryo in his care. The number which are destroyed by cold rains and winds must be very great indeed. As soon as they are safely past this stage and scatter and swim at various depths, their risks from accidents and enemies are greatly diminished. Up to this point, which is reached in from twenty-four hours to six days, there is no difficulty in rearing them in an aquarium, provided uniform warm temperature be preserved."

Although we failed to keep the young oysters alive until they were large enough to handle and plant, our experiments showed the possibility of rearing them in unlimited numbers, so soon as some practical method of preserving them alive during their infancy should be discovered.

The next great step in this direction is due to Lieut. Winslow. While we were carrying on our experiments at Crisfield, in 1879, this officer was engaged in examining the oyster beds of Tangier

Sound, and he made frequent visits to our laboratory and learned our methods. The next year, while stationed at Cadiz, Spain, on naval duty, he repeated the experiments with Portuguese oysters, and showed that these like the American oysters have the sexes separate, and that the eggs are fertilized in the water; that the young are independent of parental protection, and that they can be artificially reared like the oysters of our waters. His results were given in a paper which was read before the Maryland Academy of Sciences, in November, 1881, and this paper was afterwards printed in the American Naturalist.

The next great step was the discovery of a simple and practical method of rearing the young oysters which are hatched artificially, and this step, which completes the solution of the problem, and puts it within our power to remove forever all danger of the extermination of the oyster, is the contribution of a French naturalist, M. Bouchon-Brandeley. This author, like Winslow, experimented with the Portuguese oysters, and while he does not seem to have been acquainted with Winslow's paper, he arrived at the same conclusion, and showed that the sexes are separate, that the eggs are fertilized in the water, and that the young may be hatched artificially, but he also went one step further, and succeeded in rearing in this way a very great number of seed oysters fit for planting.

His paper was translated by J. A. Ryder, and printed April 19, 1883, in the Bulletin of the U. S. Fish Commission. The following extracts from this translation show the character of the methods which are employed, and the results which were obtained:

"REPORT RELATIVE TO THE GENERATION AND ARTIFICIAL FECUNDATION OF OYSTERS, ADDRESSED TO THE MINISTER OF THE MARINE AND THE COLONIES."

"BY M. BOUCHON-BRANDELEY,"

"*Secretary of the College of France.*"

"*Journal officiel de la Republique Francaise.* December 16 and 17, 1882, pp. 6762–6764 and 6778–6782 Translated with notes, by JOHN A. RYDER, in the bulletin of the U. S. Fish Commission, April 19th, 1883."

"Since the creation of the ostracultural industry, the administration of the marine has not ceased by divers means, grants of money, missions, etc., to encourage all attempts having for their object the development of this industry. It is undoubtedly to this that ostraculture owes its present prosperity and the constant progress it has realized, a progress which was shown in so worthy a manner at the exposition at Bordeaux."

"Faithful to this tradition, you have been good enough, monsieur, to authorize us, under your auspices and with your encouragement, to make the investigations of which we herewith present an account."

"The mollusk, known under the name of the Portuguese oyster, has not existed upon our coast for more than thirty years."

"It is superfluous to here describe their external form, in that it does not recall that of *O. edulis*."

"In respect to sexuality, the difference between these two mollusks is very great; most radical. *Ostrea edulis* is hermaphrodite; *O. angulata* is unisexual or dioecious. We have opened more than 10,000 in all phases of reproductive activity, and we have not seen a single one of the latter of which the sex was doubtful. They were all either exclusively male or exclusively female."

"No less marked is the difference in the mode of reproduction. The eggs of the common oyster are fecundated within the valves of the parent, apparently within the openings of the oviducts; those of the Portuguese species on the bosom of the waters. The first cannot develop outside of the incubatory cavity of the parent; the second undergo their development in the open currents. The larvæ of

O. edulis, in order to live, develop and attain the errant or pelagic stage of their existence, are dependent upon the albuminous liquid secreted by the mother; those of *O. angulata*, more vigorous, more independent, and altogether more active, transport themselves into the living waters to there take up the nutritive matters which are necessary to transform them into spat."

"ATTEMPTS AT ARTIFICIAL IMPREGNATION."

"When after two years we had learned for a certainty that the sexes of *Ostrea angulata* were confined to separate individuals, we immediately conceived that it was possible to artificially fertilize the eggs of this mollusk. We were likewise encouraged by the experiments which Brooks, of the Johns Hopkins University, of Baltimore, had made upon *Ostrea virginica*, likewise unisexual, and which had enabled him to follow the development of the embryos to the formation of the shell."

"We began some experiments in the laboratory of embryogeny of the College of France, which, without being conclusive, indicated none the less the path to be pursued, and the manner in which our experiments were to be conducted. In the course of the same year these experiments were repeated at Arcachon without much success. Last year we obtained mobile larvæ for the first time. The observation much surprised us; we had not long to wait, for after an incubation of only twelve hours, a precocious outward manifestation of life was apparent, for already in this phase of their evolution these larvæ presented an appearance which left no doubt as to their definitive form."

"At the end of last season we little thought, considering the slowness with which our studies had progressed, that we would be able in a single campaign to solve the problem of artificial fertilization applicable to the ostracultural industry; we were also not at first assured of our ability to produce the manifestation of the phenomena which we have observed with so much interest and upon which rested our hope of final success."

"In recommencing the work we were obliged to make choice of a convenient station for our experiments. The station of Verdon, situated on the left bank of the Gironde, at a distance of several kilometers from the mouth of the river, seemed to us to combine all the desired advantages. We were assured of finding there the oysters fitted for spawning, as well as suitable water. In fact, the first attempt which we made in artificial impregnation in fourteen hours afterwards resulted in the production of mobile larvæ, notwithstanding that the season for the fry had not yet arrived, commencing at least a month later."

"M. Tripota, one of the veteran ostraculturists, and at the same time one of the most competent, very willingly, at the request of the commissioner, M. Jouan, placed at our disposal, with a grace and disinterestedness for which we are under great obligations, two beautiful unsubmersible claires, which received fresh water for several days during the spring tide, and which were soon arranged for our use by means of some slight internal alterations. Separated from each other by a straight, massive wall of earth, these two ponds, with an area of about 100 meters each, and an average depth of 80 centimeters to 1 meter (27 inches to 3 feet), were placed in communication by means of a pipe, which was closed at either end by a sponge to keep out any sediment in suspension in the water. In this manner all doubt as to the origin of the spat which was collected was guarded against."

"For the outlet, an apparatus consisting of a wall of fine sand confined by boards permitted the water to percolate through it, but prevented the embryos from escaping with it. The lowermost claire only was utilized in our experiments. The uppermost claire, in which we stored the water whenever it was possible, served as a reservoir from which to decant, the supply pipe allowing nothing to pass into the experimental claire except clear water."

"This arrangement completed, the products of artificial fecundation, impregnated in various ways, were poured into the experimental reservoir. This took place in the second week in June."

"According to our belief, we hoped to find some spat on the collectors placed in the experimental claire at the end of the same month or by the beginning of the month of July. M. Tripota, who had taken an active part in the work, and who took my place in my absence, continued to supply the claire with fertilized eggs and mobile embryos."

"The time assigned for experimental proof having arrived, the collectors were examined, but they did not bear any apparent trace of spat. This was a deception. Meanwhile, thinking that the season for the fry had not yet begun in the Gironde, we expected happier results from our final experiments. The claire was emptied, and some modifications were introduced in the management of the water, and from day to day mixtures of the generative products were again poured into the claire."

"On the 24th July the tiles were examined. This time all had spat attached. It was therefore evident that the first experiments had not been as unsuccessful as we had supposed. In fact, each of the tiles immersed had young oysters attached to the number of twenty or thirty, measuring about a centimetre (two-fifths of an inch) in diameter. This spat was evidently derived from the spawn put out during the end of June or the commencement of July; but their small size had prevented us from seeing them when the inspection was made at that time. On the 24th July we had specimens about a month old. This fact was all the more remarkable, in that, up to that same time, the collectors placed in the Gironde, in the very center of the spawning beds, did not show a sign of spat."

"The problem which we had put before ourselves had accordingly received, from a scientific and practical point of view, a solution in conformity with our hopes. It was possible to obtain spat by means of artificial fecundation and to capture it in confined waters. And we no longer had the slightest reason to doubt the identity of that which had caught on our tiles, nor to suppose that it came from the waters without, since there was as yet none apparent in the Gironde, and the tiles in the upper claire, which served to feed the experimental claire, were completely exempt."

"If in forcing nature's processes, we arrive at the same result, that is, provoke the birth of the young before the time of the normal emission of the spawn, there is all the more reason for us to suppose that we have an excellent means to aid and favor her."

"In pursuing our researches in the establishment of M. Tripota, we did well to vary our means of investigation whenever the same bore upon the industrial aspects of the work."

"On the rights (parks) along the Canal de Conseiller, and fed by it, there exists old salt marshes, for the most part abandoned, or used for other purposes than formerly, some of which have been transformed into reservoirs for fishes. Those which we appropriated were about two kilometers from the river and from the locality chosen at Verdon, and received fresh supplies of water during the spring tides. They consisted of numerous compartments, varying in depth and communicating by wide trenches cut into the banks separating them from each other. Their total extent somewhat exceeded a hectare. During the new and full moon the gate controlling the supply was opened to allow the fish carried by the current to enter and to renew the water. This maneuvre was repeated many times during the tide. On account of the situation occupied by this marsh along the exposed shores of the Gironde, the water is never stagnant, even at the time of the neap tides. The sea breezes and winds which follow the course of the river aerate it perpetually and agitate its surface. Those which we had chosen measured 5 to 6 feet in depth at the center and 2 to 3 along the margin. Stakes placed at intervals supported the fragments of tiles suspended with iron wire."

"From the beginning of July to the end of August, M. Gassiau, school-master at Verdon, who assisted us during the entire campaign, with an intelligence, zeal, and devotion worthy of the highest

praise, took care to pour into the inclosures, several times a week, the products of the artificial fecundations which he prepared with rare skill and certainty. Three hundred oysters only were used in these experiments."

"On the 8th of August he visited the collectors, and observed on all of them, without exception, hundreds of young oysters, measuring one-half to two millimeters in diameter ($\frac{1}{50}$ to $\frac{1}{12}$ of an inch). The spat grown from each of the successive lots of fertilized spawn could be distinguished by its size, which corresponded to its age. Having the curiosity to know how many fixed themselves to one tile, we counted more than eight hundred on a single piece of tile, of which the size was one-fifth that of an entire one. This time our success was complete."

"Up to the end of August, the time when the oysters had nearly all spawned, the spat continued to attach itself just as abundantly to all kinds of collectors with which it came in contact indiscriminately, fragments of tiles, pieces of wood, boards, &c."

"Doubt was no longer possible. The pessimists asked whether our nurslings would grow and develop equal to those which were naturally collected on the banks of the Gironde. We responded to this objection by sending some of the tiles to be placed in the parks at Arcachon, where they remained for a month and a-half."

"These tiles and fragments of tiles figured at the end of September in the exposition at Bordeaux by the side of those which had been brought by MM. Tripota and Gassiau."

"We also found that the spat born in the beginning of July, in the closed claire, measured from three to four centimeters in diameter, and that which was collected in the salt-marsh by the end of July and during the month of August had attained the dimension of one centimeter (two-fifths of an inch) in diameter. Finally, during the early part of October, we had the honor of presenting to the minister of marine a tile upon which two thousand young oysters could be counted, measuring from one to two centimeters (two-fifths to four-fifths of an inch) in diameter."

"It now remained for us to make a final demonstration. It was necessary to prove that the spat which was collected did not primarily emanate from the banks in the Gironde, but was the result of the artificial fecundations practiced under our care. This proof was evidently superfluous after what had taken place in the closed and poorly aerated waters of the claire where we had in the first place established ourselves. We knew, in fact, that the person who cultivated the marsh had attempted in vain, two or three years before, to collect spat. But, in undertaking this counter-experiment, we had a two-fold object in view, viz, to clear up all doubts, if still such existed, as to the value and advantages of the method of artificial fecundation, and that of creating a sentiment in its favor. This proof had to be conclusive."

"At the entrance to a fish-pond close to the one used by us, of nearly the same extent, similarly arranged and receiving water from the same canal, had been placed the tiles upon which it was thought the spat coming from the river would not fail to attach itself. At that time the oysters were in the height of reproductive activity; the collectors in the Gironde were being charged with spat, and ours in the other pond were being covered as fast as and in the proportion that they were immersed. We expected to find some young oysters on the collectors put down as a test. There was nothing on them, however; these collectors remained completely free of all traces of spat."

After the successful results of these experiments the only thing which remained was to show that they can be successfully repeated in our own waters, and after translating Brandeley's paper, Mr. J. A. Ryder constructed on the coast of Maryland a similar pond, in which he placed a number of artificially fertilized eggs, and on September 6, 1883, he reported that these young oysters had grown and thriven as they had done in France.

EXPLANATION OF PLATES XII AND XIII.

The cuts upon these two plates are from Coste's Report.

PLATE XII—FIGURE 1.—Artificial oyster bed, surrounded by stakes for the attachment of the spat.

FIGURE 2.—Stakes planted in a straight line and united by a rope, to which bunches of branches are suspended, to furnish an attachment for the young oysters.

FIGURE 3.—Knife for removing the young oysters from the tile collectors.

FIGURE 4.—Platform collector for muddy bottoms.

PLATE XIII.—Outside view and internal arrangement of box collector, for collecting a great number of oysters in a small space. The box is filled with trays, like those shown in Figure 7 of Plate V, and these trays are filled with shells and spawning oysters.

(We are indebted to Professor S. F. Baird for the use of these two plates.)

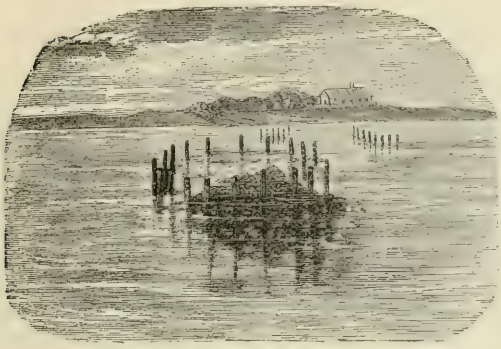


FIGURE 1.

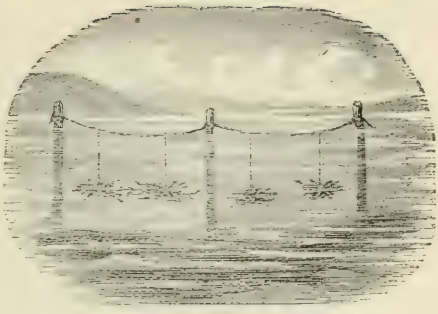


FIGURE 2.

FIGURE 3.

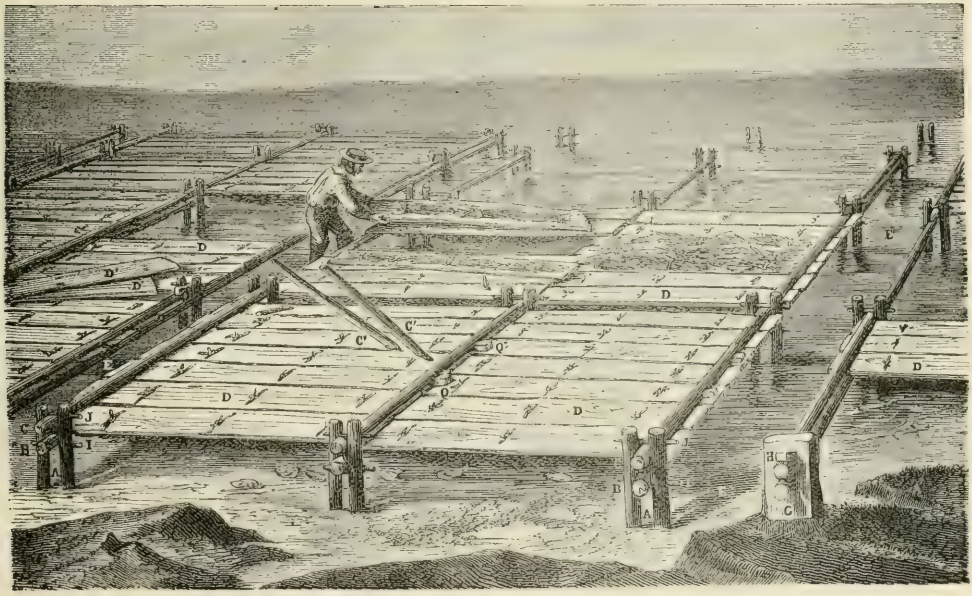


FIGURE 4.

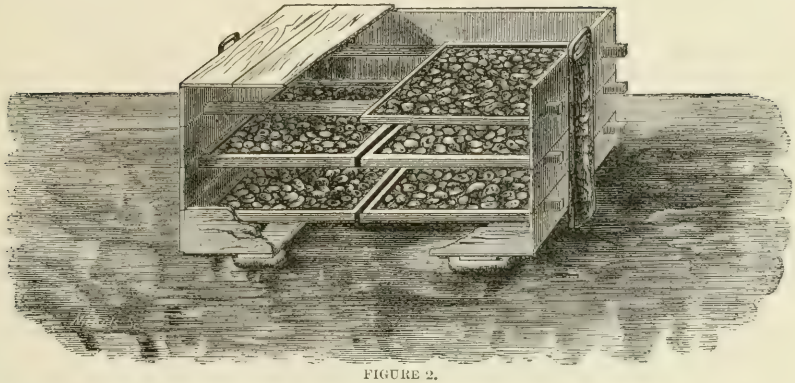


FIGURE 2.

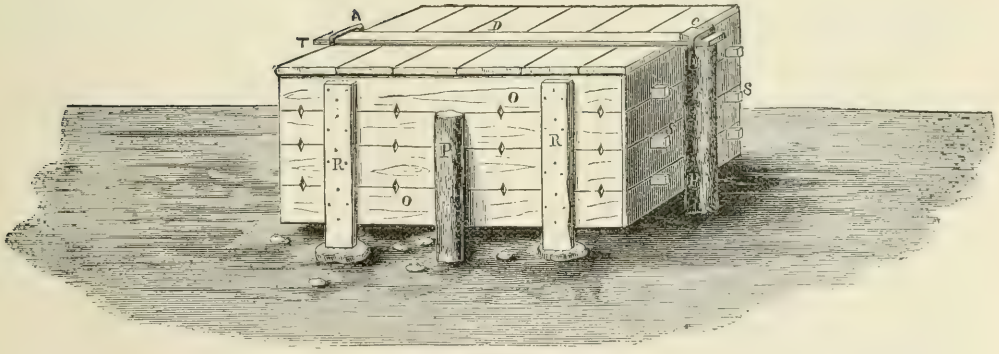


FIGURE 1.

His paper was printed in the Bulletin of the United States Fish Commission, September 6, 1883, and from it we make the following extracts:

REARING OYSTERS FROM ARTIFICIALLY FERTILIZED EGGS, TOGETHER WITH NOTES ON POND-CULTURE, &C.

BY JOHN A. RYDER.

"The desirability of testing the breeding of oysters in ponds in the United States, as practiced for many years past in France, has long been a desideratum."

"In order to test the feasibility of such a method on a scale large enough to give us practical results, an arrangement to carry out such a scheme was finally effected with the Eastern Shore Oyster Company in June of the present year. The beds near where the work was undertaken are owned by Messrs. Pierce & Shepard, who afforded the writer every opportunity to carry on his investigations, and also aided him very materially in the work of experiment. A pond was excavated in the salt marsh on the shore of Chincotegue Bay, on a farm situated at a distance of about 2 miles from the village of Stockton, Worcester County, Maryland. This pond covered an area of about 50 square yards, and was connected with the bay by a trench or canal about 10 feet in length, 2 feet in width, and 3½ feet in depth, which last was the same as that of the pond itself."

"The water which supplies this pond was filtered through a permeable, porus gate, or diaphragm, which was placed in the trench connecting the pond with the bay, and no water was allowed to enter the pond which had not been first filtered through this diaphragm."

"The diaphragm itself was constructed of boards perforated with auger holes and lined on the inside with gunny-cloth or sacking; and the space between the perforated boards filled with sharp, clean sand. The space between the boards was about two inches; through this the tide ebbed and flowed, giving a rise and fall of from 4 to 6 inches during the interval between successive tides."

"The collectors used in our experiment were of the simplest possible character, the object being to make the experiment as practical in character as possible. To this end stakes were driven into the bottom of the pond, extending above the surface some distance, to which oyster shells, with holes punched through, were attached after being strung upon galvanized iron wire. A number of these simple collectors were placed in the pond, each set being marked with the date on which they were placed in position, in order to afford data for a more detailed study of the results of the experiment."

"RESULTS OF THE EXPERIMENT."

"On the 22d day of August, or 46 days after the beginning of our experiment, Mr. Pierce sent me by mail a series of shells taken from the collectors, which had been placed in the pond at various dates during the month of July, and which showed young oysters or spat attached, ranging from one-fourth to three-fourths of an inch in diameter; demonstrating conclusively that the young would grow just as rapidly in our pond as in the waters of the open bay. Of this last fact I am positively assured on the ground of previous observations made during the three preceding seasons."

"We are therefore prepared to assert that it is perfectly feasible to rear oysters from artificially fertilized eggs, and, so far as I can judge, quite as successfully as by the method of sowing shells on the bottom, now largely practiced on the coast of Connecticut in the waters of Long Island Sound. While our experiment has not shown that we could get a greater set of spat than that ordinarily obtained under natural conditions on planted shells, the experiment has settled several questions which are of the greatest importance in the practical work of oyster culture."

"One of the difficulties encountered was the same as that met with in shell-planting in the open waters, namely, the accumulation of slime and ooze on the surface of the collectors, which is so deadly to the infant oyster when it is from one five-hundredth to one-ninetieth of an inch in diameter, a very slight quantity of sediment serving at this time to smother the infant mollusk and arrest the flow of water through its tiny gills, thus producing death by asphyxia."

"UTILITY OF THE EXPERIMENT."

"The practical utility of the experiment, in the writer's estimation, consists in this, that it proves that ponds or inclosed areas of water may be readily utilized on the eastern coast of the United States for cultivating oysters in the same way as is practiced in France and other foreign countries. In fact, there are many thousands of acres of salt marsh all along the eastern coasts of the States of Virginia, Maryland, Delaware, New Jersey, and perhaps New York, and Chesapeake, Delaware and Chincoteague Bays, which could be readily converted into permanent and profitable planting grounds for the cultivation of oysters."

"The great advantage of this method would be that the persons constructing the inclosures or digging out the ponds on their own territory would be absolutely protected by law from the incursions of the lawless tongers whose rights and privileges are not yet as clearly defined in some of the States as they should be. The method would also be of advantage, from the fact that inclosed areas, properly constructed, are more accessible—in fact, could be so arranged as to be worked without the use of boats. It would also be found that oysters would fatten and come into condition for market at a relatively much earlier time in the season than those planted in open, unconfined waters, where cold currents interfere with the abundant development of food."

"The collectors best adapted for waters which contain a large amount of organic matter in suspension are evidently brush or stakes supporting strings of oyster shells strung on wire, because the tide will constantly tend to sweep the accumulated sediment off the surfaces of the twigs and shells. Such collectors should of course be put into the water upright, so as to cause the collecting surfaces to be far above the bottom, which is usually covered to a depth of from a few inches to several feet with black ooze or mud in such situations. The brush should be thrust with the main stem down into the mud far enough to support the branched top against the tide, and also be so placed as to bring the top below low water. The stakes, with their load of shells, should be arranged in a similar way."

"These two forms of collectors seem to me to be the cheapest and most available in the practical work of spat collecting where the water contains much sediment and the bottom is too deeply covered with ooze to make shell planting profitable. Where the ooze is too deep shells will rapidly sink into it, so as to be entirely covered, and afford no surface to which young spat can attach itself and grow."

"By means of some such method a large area can be rendered profitable as planting ground which is now utterly barren and useless for such purposes."

"These are mere suggestions, but I am fully convinced from the facts which have come under my observation during the last three years that they are very important ones, because in many cases it is evident that all that is needed to get spat is to afford surfaces upon which it may attach itself in those situations where the bottom is deeply covered with mud and where the fixation of spat and the establishment of oyster-beds is often, without such provision, a sheer impossibility. The importance of placing collectors in such places must, therefore, be evident to the intelligence of the most ordinary person."

"ECONOMICAL SIGNIFICANCE OF THE STOCKTON EXPERIMENT."

"The success in rearing oysters from the eggs, as practiced at Stockton the past summer, admits of no doubt whatever; inasmuch as there could be no question as to the identity of the eggs from which the

spat which caught on the collectors was derived. No other ova could by any means have gained access to the inclosure, so as to vitiate our results. But this success I do not esteem of as much value as the facts of collateral importance which it has substantiated. These are the following:"

"First. It has proved that oysters may be grown in inclosed ponds."

"Secondly. It has proved that an abundance of food will generate in such inclosures."

"Thirdly. It has proved that we can depend upon the tide to renew the waters of such ponds."

"Fourthly. It has been shown that the cost of digging out ponds on an extensive scale would be a comparatively inexpensive undertaking, because no digging is required except such as can be done with a spade. The nature of the salt marsh is such that it can be cut into any shape desired; the black muck of the marsh being interpenetrated with great numbers of roots and decayed fibres of vegetable matter which renders it tough, so that it can be cut out in solid blocks. About the depth of what would be taken by three superimposed spadesfull is a sufficient excavation for the purposes of pond culture in many places. There are thousands of acres along the eastern coast of the United States of salt marsh lands which are available for pond culture, besides the ground already occupied off-shore; so that the development of the industry seems to be practically unlimited. Wherever the water is fresh enough to grow oysters, and where such marsh lands also exist, the construction of ponds for oyster culture is feasible on just as grand a scale as is now practiced on some parts of the coast of France."

"The writer does not think that the rearing of oysters from artificially impregnated eggs will ever be a profitable business, in that it is likely that collecting spat by simple and inexpensive methods, such as the use of brush, shells, gravel and other cheap, clean materials, will always yield as good results on a large scale as any artificial method could possibly give. But it is possible that we greatly underestimate the value of wholly artificial methods."

SUMMARY OF CHAPTER.

In the preceding sections we have given many reasons for believing that the only remedy which can save our oyster beds from final destruction, without at the same time destroying the oyster industry, is artificial production of oysters. We have shown that the natural supply is insufficient for the demand, and that the natural fertility of our oyster grounds must be increased by some method of artificial oyster culture.

We have also shown that it is quite possible to increase the supply, and that this has been done with perfect success in many parts of the world, in many ways, and that it is extremely profitable.

We believe that, having done this, we have performed our duty, and that this should end our work.

We have pointed out the danger; we have shown the reasons for it, and we have fully described the remedy. It must rest with the people of the State to decide how soon, and in what manner this remedy is to be employed.

While we feel that we have performed the duty for which we were appointed, and that we have, to use the words of the resolution under which we were appointed, made "such recommendations as will conduce to the protection of this important industry," there is still another subject upon which to say a few words.

It rests with the General Assembly of Maryland to determine what steps shall be taken to encourage oyster culture, but the experience of other States furnishes us with several instructive lessons on this subject.

Oyster cultivation may be carried on by the State or by private citizens, and as both of these plans have been tried, we may learn from the history of the industry in other places which of these plans is most likely to be successful.

Every one knows that all ordinary business enterprises thrive best in private hands, and that it is extremely difficult for government to manage, with pecuniary success, any such undertaking.

The feeling that the cultivation of our salt-water fisheries is an exception in this particular is very widespread, and there are many good reasons for this feeling.

Salt-water fishes are migratory, and it is impossible to confine them without restricting navigation, and it is therefore almost impossible to secure to private enterprise the right to the fruits of its exertions. For this reason we have long recognized the necessity for State aid in this matter. It has been obvious for many years that our natural supply of sea food is insufficient for the needs of our people, and most of our States, as well as the General Government, have maintained Fish Commissions to restock our waters, at public expense, for the benefit of our whole people.

It is important to bear in mind that the reasons which justify this course do not apply to the oyster industry. The private ownership and cultivation of the oyster bottoms need not interfere in any way with the free navigation of the waters above them, and as the oyster stays where it is put, there is no difficulty in securing to private cultivators the fruits of their own industry.

Nothing, which can be safely intrusted to private enterprise, should be undertaken by the State, and the history of the oyster fishing of Connecticut and Rhode Island, as well as that of France, shows that oyster culture can safely be intrusted to the private interest of the oyster farmers.

We, therefore, believe that the oyster property of the State should be put into the hands of private farmers, but there are many reasons why this should not be done immediately.

In the first place, it is impossible to state at present, with any accuracy, what is the value of this property. The money value of the oyster bottom of our bay is very great, but no one can say exactly how great, and as the State should not part with the public property without a proper return, we do not advise the sale of any considerable amount at present.

In the second place, our own people have at present little practical experience in the methods of oyster farming, and are not yet prepared to engage extensively in the business.

We, therefore, believe that it will be wise for the State to set aside a tract of oyster bottom as a State oyster farm, and to replenish and restock it, in order to exhibit to our people the value of oyster farming, and to give to them an opportunity to witness the methods of working and the practical results, and also in order to obtain a more exact and definite estimation of the value of our oyster bottoms per acre.

The establishment of such an oyster farm will require a large investment of capital for a year or two, but a system of thorough cultivation for a term of five or six years, could be made to return this investment, besides yielding a great quantity of oysters for the use of the public.

In another part of this report we have recommended that certain districts be closed to the public for a term of years, to give the oyster beds a rest, and to allow them to become replenished.

We recommend that one of these districts, the one described in another part of this report, of District Number Four, be set apart as a State Oyster Farm, and that an Oyster Commissioner or Oyster Farmer be appointed to restock and cultivate it at the public expense, for the good of the public. We recommend that a board of State Oyster Commissioners be established, and that it consist of three persons: the Commander of the Fishery Force, the Comptroller of the Treasury, and a third commissioner who shall be appointed by the Governor, who shall have immediate charge of the Oyster Farm, and that the board of State Oyster Commissioners shall act under his direction to restock the farm, and that they be required to employ all means known to them for this purpose.

The area above described is only a small part of the whole bay, but we believe that it will be much wiser for the State to devote all its attention at present to the attempt to thoroughly replenish a small area, which can be kept under direct supervision, and we have therefore selected the district which immediately adjoins Annapolis.

This district is small enough to be managed, and an experiment here for five years would prove whether it is worth while for the State to undertake the task of replenishing the whole bay, and it would show the cost of such an undertaking, the return which might be expected from it; and it would also

demonstrate the best methods. Three years would probably be long enough to show how many oysters had been raised upon the oyster farm, and similar measures could then be employed upon a more extensive scale if such action proved advisable.

We have recommended, in another place, that laws be enacted to compel the return of oyster shells to the bay, and this measure will serve to increase the productiveness of our waters, to some extent, although we cannnot expect from it the good effects which will follow through cultivation, under efficient and constant supervision, upon a limited area.

As soon as the State farm is fully stocked with marketable oysters, which would probably be in about three seasons, it should be thrown open to the public, but a record should be kept of all the oysters removed from it, and it should of course be made to pay back into the State Treasury the money expended in cultivating it. The best method of doing this is to collect a tax (say five cents a bushel) upon all oysters taken from it, and the method of collecting this tax should be determined by law before the farm is opened to the public.

The revenue from this source would show whether it is expedient for the State to continue the business on a larger scale, but your commissioners believe that the true policy is for the State to do only enough in this direction to instruct our people in the methods to be employed, and that the whole matter should then be left to private enterprise.

The history of French oyster culture is of very great interest in this connection. Nearly twenty-five years ago the French government undertook the cultivation of oysters in order to restock the exhausted beds. The government farms were at first very successful, and they not only proved that oyster farming is very profitable, but they also served as a school for the instruction of the public in the methods of oyster culture. This example was followed by private cultivators, and the private industry upon the French coast is now in a very prosperous condition, but a government report (Oyster Culture in Morbihan) upon the subject in 1875, contains the statement that "the worst merchant in France is the State."

This report shows so clearly the great superiority in every respect of private enterprise over government management, that we beg leave to call attention to the following extract:

"Coste did not doubt the result; failure seemed to him almost impossible; he foresaw the complete transformation of the sea coast, and exclaimed, in his letter of March 20, 1861, to the Emperor: 'I thank your Majesty for having placed me in the front ranks of the greatest enterprise of the age, in connection with animate nature.' Attempts were multiplied, but progress and success seemed more and more retarded and lessened in the course of time. The bay of Saint-Brieuc was swept by a tempest. At Arcachon discouragement seized upon those who, in the beginning, were most enthusiastic, for little or no spawn was collected. Coste heard the name of charlatan sounded in his ears; his work was ridiculed even by those whom, in the expectation of success, he had loaded with favors, and our modern Athenians were lavish in criticisms, in which neither sarcasm nor bitterness were spared. Enfeebled by his labors and deprived of sight, Coste struggled on. He hoped against all hope, and maintained that the application of his principles would even change the social conditions of the sea-coast communities. His views were met only by incredulity. He died at his post, despondent, greatly discouraged, and to the last hour misunderstood by that multitude, who treat with contempt all great ideas which do not meet with immediate success. While others were occupied in criticising, a few men labored faithfully, and in a few years, between 1868 and 1875, the production and cultivation of oysters made remarkable progress on the shores of Morbihan."

"*Principal cause of the failure of Coste.*—It is evident to all that, in spite of the scientific knowledge, the zeal and the labors of Coste, his attempts, so far as regards commercial results, were radically fruitless. Nevertheless, he had at his disposition apparatus, boats, auxiliaries as intelligent as devoted, and also, to a certain extent, the resources of the public treasury. Still, the reason is very simple. That impersonal being, called the State, is incapable of creating any industry. It sufficed to relinquish oyster culture to the culturists, who, although intelligent and well informed, are, in the majority of cases, neither savants nor academicians, to insure success where only failure had been predicted."

"This is because the State lacks that powerful lever called individual interest. An occupation is not possible unless an assured profit may be realized from it. The merchant alone can be certain of this, from a study of the markets and the demands of consumers. The poorest merchant in France is the State. The State has quite another part to play. Charged with the protection of all, it cannot descend from this elevated sphere of general usefulness into the arena where opposing interests are contending—an arena which it always leaves defeated and often injured. To abandon its reserve, and endeavor, by taxation, to create a national industry, is an act of socialism, generous, perhaps, but from which others will derive the benefits."

"Napoleon III, in his youth, had a passion for studying these questions, and sometimes lent an attentive ear to these grand socialistic theories; this was why Coste obtained so much support from the Emperor. Led away by his own ardor, he did not notice that he was gliding down a fatal slope, and that he would fall at last, in spite of all his efforts. If, instead of going to the Tuilleries, he had addressed himself to an association of capitalists, or to the trade, who could have participated in his confidences, then oyster culture, disengaged from the shackles of the State, would, from the beginning, have taken a higher stand and progressed with surer steps."

"We do not wish to underrate the importance of the part played by the State, for we are going to appeal to its aid in another matter; but we think it should be well understood that the two domains, of industry and of government, are totally distinct. By confounding them, powerlessness replaces fertile effort, and the most important work is crowned only with failure."

"We do not wish, in any way, to diminish the gratitude due to those, whether functionaries of State or others, who have labored for the creation and development of this industry; but we feel the necessity of proclaiming, in a certain measure, the omnipotence and vigilance of individual interest. We believe that, imbued with this thought, the public administration would desire, even more in the future than in the past, to free from fetters and obstacles the pathways along which this industry must move, in order to attain a high degree of prosperity."

It must be plain to every one that our hope for an abundant supply of oysters in the future must rest upon the growth of a private farming industry, rather than upon State aid, and we come now to the question, what shall be done to encourage private oyster culture?

We believe that the advantages, to our whole people, of a thorough system of cultivation, are so very great that they should overbalance every other consideration, and we also believe that any person who wishes to engage in this business should have his path made as easy as possible. The question of immediate revenue to the State is a very secondary consideration, for the development of our oyster farming industry would increase the prime source of revenue, productive real estate, and the whole community would ultimately reap the benefits of the taxation of the oyster farms.

The chief danger which is to be avoided is the monopoly by a few persons of the oyster area, and this danger can be avoided by granting to any resident of Maryland who wishes to use it, a small farm for oyster culture.

The law known as the "five acre law," gives to any resident the right to appropriate five acres of ground, where there are no oysters, for oyster planting. The holder pays nothing for the right; he receives no title from the State, and he pays no taxes.

We recommend that the State give to each holder of land under this law, a lease or title, like a title to real estate, making it his forever, so that he can dispose of it or mortgage it to obtain the necessary capital for cultivating it, and that the nominal fee of one dollar per acre be charged for the lease. We believe that it would be wise to grant this privilege to all persons, residents or non-residents, but we leave this subject for future consideration, as well as the question whether it is wise to permit one person to hold more than five acres by purchase from other holders. The title should be made as absolute and unqualified as a title to real estate, but we have not made it so in the bill which accompanies this report, since many points can be discussed and settled at some future time.

We believe and recommend, however, that the law should be amended in such a way as to permit any resident of the State to appropriate his five acres, whether it contains natural oysters or not.

Our waters are so favorable for the growth of oysters that there is scarcely a spot where some oysters have not at some time existed, and, in the absence of all surveys of the oyster area, we believe that the restriction should be removed.

If public sentiment condemns this course, the next best plan is to construct, as quickly as possible, from actual surveys, maps showing the areas which are to be legally regarded as natural beds, and to permit private oyster culture on all other areas.

This would delay the establishment of private farms for several years, and it is, therefore, only named as a second resort. In our State the oysters are so widely distributed that it will be extremely difficult to decide what is to be regarded as a natural bed, and we have shown, in another part of our report, that the area of our beds has been greatly increased by the action of the dredgers in breaking up and scattering the clusters of oysters and shells.

The limits of a bed are thus changed from year to year, and the only way to decide what grounds are to be reserved is to designate certain areas as natural beds within the meaning of the law.

The natural oyster beds of Connecticut are few in numbers and sharply defined, compared with those of our own State, and they cover, according to the most liberal estimates, less than eight square miles, all told, while our own natural beds cover hundreds of square miles; yet the Connecticut oyster commissioners have experienced great difficulties in their attempts to determine what are to be regarded as natural beds, and they have given the following account of the perplexing nature of the subject:

"In the discharge of their duty of exploring and mapping natural beds, the Commissioners have "experienced no little difficulty. Great difference of opinion exists as to what constitutes a natural bed, "while the testimony as to their size and shape is conflicting and largely untrustworthy. No pains have "been spared to secure all the information about the beds that was possible. When a hearing was "agreed upon, due public notice of the time and place was given, so that all who desired could be heard. "The place for the hearing was selected with a view to the convenience of the witnesses rather than of "the commissioners. Parties appeared not only in person but by counsel, and an exhaustive examina- "tion was had in every case. The witnesses were generally divided into two classes—one consisting "mainly of those whose work was confined to the natural beds, and the other who may be classed as "oyster growers. The former sought to make the natural beds as large in extent as possible, while it "was for the interest of the latter to so restrict them as to leave portions thereof open for designation "and cultivation, for which purpose these and adjacent grounds are very valuable."

"It is the obvious design of the law that the natural beds shall be preserved in their entirety for the "use of the public; hence the law makes the commissioners liable to severe penalties if they knowingly "make grants which encroach upon them, and such grants are absolutely void."

"Such being the fact, it becomes an important preliminary question, what, according to the intent "of the law, is a natural bed?"

"Various definitions have been attempted. In one sense, all oyster-beds, whether the result of culti- "vation or of accident, are natural beds. But it is not in this sense that the term is commonly used and "understood. To quote from last year's report, 'all grounds of any considerable extent, under water, "which are found overspread with growing oysters, are generally called oyster beds. They are artificial "or natural. Those designed and planted by man are artificial beds; all others are natural beds, and "they are formed by spat from other beds, drifted by winds and tides and deposited upon a bottom suita- "ble for its adhesion and growth.' This definition is correct in a general sense, but it does not accu- "rately describe the natural bed which the law designs to recognize and protect. Small isolated patches "of natural growth oysters cannot be deemed natural beds within the meaning of the law; but when such "patches are found scattered over an extent of ground in sufficient abundance to remunerate the oyster- "men, a greater or less number of years in succession, for the labor of gathering them, there is such a "natural bed as the law recognizes and protects.'"

"This is substantially the idea of those who have labored on these beds for many years. In their "testimony before the commissioners, a natural oyster bed with them was an uncultivated bed where "they could find oysters 'in paying quantities,' where they could do 'a fair day's work,' and this view is "sustained by legal authority. By the laws of Maryland, no natural bar or bed of oysters can be desig- "nated. A case arose in Dorchester county involving the construction of the term 'natural bed.' After "an able discussion by counsel, Judge Charles F. Goldsborough decided as follows: 'There are large and "numerous tracts where oysters of moderate growth may be found in moderate numbers, but not in quan- "tities sufficient to make it profitable to catch them, and yet where oysters may be successfully planted "and propagated. In my opinion, these cannot be called natural bars or beds of oysters within the "meaning of the acts of the Assembly, and it is just such lands as these that the State meant to allow "to be taken up under the provisions of the act. But there is still another class of lands where oysters "grow naturally and in large quantities, and to which the public are now, and have been for many years, "in the habit of resorting with a view to earning a livelihood by catching this natural growth, and here, "I think, is the true test of the whole question. Land cannot be said to be a natural oyster bar or bed "merely because oysters are scattered here and there upon it, and because, if planted, they will readily "live and thrive there; *but wherever the natural growth is so thick and abundant that the public resort "to it for a livelihood, it is a natural bar or bed, and comes within the above quoted restriction in the "law, and cannot be located or appropriated by an individual.*' The last lines are italicized as compre- "hending the true legal definition of a natural bed."

"And yet to determine at any given time what grounds are to be considered as fairly embraced "within a natural bed is not an easy matter. If they were uniformly productive throughout their entire "surface, and this without variations from year to year, there would be no difficulty in determining and "mapping their outlines. But this is far from being the facts. The oysters grow in patches and streaks "on the natural beds, with intervening bare spots of larger or smaller area. What are barren spaces "this year may be covered with oysters the next, and so the bed may be continually changing. Still the "changes are always within certain limits, so that the general area and outline of the bed is preserved. To "ascertain this general area and outline two ways are open—one to examine the bed by careful dredging, "and the other by taking the testimony of those who have long been employed in getting oysters from it. "Most oystermen dredge over a bed by following on lines ranging with objects on the shore. Some have "one set of ranges, some another, but when the ranges of a great number are combined the general out- "line of the bed is approximately determined. It is clear that from the irregular streaks and patches "which together make up a natural bed, no uniform lines are likely to be found along the edges of the "bed, but they are necessarily sinuous and broken, and they vary from year to year with the changes on "the bed. Consequently an exact delineation of the outline of the bed as it actually exists is not only "impracticable, but in a very short time it would be incorrect. Irregular lines, too, could not readily be "indicated by buoys; and it would be extremely difficult, if not impossible, for the oystermen to keep "within the limits of the bed. By adopting arbitrary boundary lines, which are approximately true, "these difficulties were overcome and great advantages secured. These lines are so chosen that the "entire natural bed is enclosed by straight lines, each of which ranges with some prominent objects on "the shore, so that any one can readily find the bed, and when working upon it can easily keep within "its limits. The commissioners respectfully recommend that the outlines thus indicated be confirmed "and established by law."

"Sometimes, but not often, natural beds become exhausted by overfishing or from other causes. The "statute of 1881 provides that designations may be made within areas which have not been natural clam "or oyster beds for ten years. Several applications have been made for grounds within areas which were "formerly natural beds, but which are alleged to have been unproductive for the period named. In all "these cases the evidence was so contradictory that grave doubts perplexed the commissioners as to what "their decision ought to be. On the one hand, it was urged that the evidence was positive that the

"grounds in question had been paying natural beds within ten years, and until the full expiration of that "period the commissioners were bound to protect them; that as it was possible that they might at any "time become productive, it would be unjust to deprive the people of their rightful enjoyment. On the "other hand, it was as positively asserted that the beds had been barren for more than ten years, and the "applicants consequently had an undeniable right to a grant of such grounds; that they ought to be "designated to the oyster grower without delay, so that the State might reap the benefit, not only of the "purchase price, but the still greater advantage resulting from an extension of artificial beds, whereby "they would make productive and profitable what were now waste places. A personal examination of "some of the grounds, with the assistance of experts in dredging, tended strongly to confirm the assertion "of the applicants that the grounds were not only at the present time barren, but that they had been so "for some years. Still the testimony to the fact that quantities of natural oysters had been repeatedly "gathered there by numerous parties within seven or eight years, constrained the commissioners to reject such "applications. The letter of the law required them so to do. And yet it is believed that some of these "grounds have really been worthless for seven or eight years, and there is not the slightest probability of "any change for the better. Considerable territory is thus placed beyond the disposal of the commis-"sioners, which otherwise might be sold without detriment to any one. A change in the law is therefore "desirable. It is recommended that the period shall be reduced; that the commissioners shall be "authorized in their discretion to designate any grounds for cultivation whenever they have been found "unproductive for a period of five consecutive years, provided they deem it best for the interests of the "State so to do."

The Connecticut policy will be seen to be that of waiting until an area has been so overfished that it ceases, for ten years, to be valuable; but it is surely unwise to wait until property is completely ruined before adopting a remedy.

We therefore believe that one of two steps should be taken immediately; the natural beds should be thrown open to private cultivators, or else the limits of the natural beds should be established by law, and all grounds outside these limits should be made available for private culture.

As thus modified the five-acre law would provide for all persons who wish to engage in oyster culture on a small scale, and near the shore; but deep-water oyster farming cannot be carried on upon a small scale, as it requires an expensive outfit and the investment of great sums of money.

We therefore believe that in addition to the five-acre law, laws should be passed to encourage deep-water farming.

This has been done in Connecticut, and Rhode Island has very recently taken the same step. An account of the Connecticut laws and methods is given in a subsequent chapter of this report; but although this is very instructive, we do not recommend the adoption of the Connecticut plan.

In Connecticut and Rhode Island any resident may obtain an unlimited area for oyster culture in deep water by the payment of $1 per acre.

The industry is exposed to many accidents, and the marine enemies of the oyster often destroy a whole crop in a few hours, and it was therefore thought best to foster the growing industry by furnishing land at a nominal price, and to look to future taxation for a return to the State treasury.

In our own waters there are few enemies to the oyster, and oyster farming would be exposed to few accidents. There can be no doubt that all our grounds are very valuable, and we therefore believe that if large areas are sold for deep-water oyster farming they should not be sold at a nominal price, but for their actual value.

It is impossible to state at present what this value is, and we therefore recommend that a small area be selected, and that the right to cultivate oysters upon the grounds within this area be sold at auction. We also recommend that the district which is hereinafter described as district number six be set apart for this purpose.

CHAPTER VIII.

Reorganization of the State Fishery Force.

(Substitute therefor Department of the Chesapeake.)

Synopsis.—Our observation during the month of November of 1882, and more recently during the months of May, June, July and August, of 1883, and information we are possessed of as to the qualification of the commander and subordinates of the State Fishery Force, is of such an objectionable character that we have considered it necessary to recommend elsewhere a more perfect organization of its personnel.

The conclusions we have arrived at, as to the reorganization of the State Fishery Force and what may be the results therefrom, are considered elsewhere.

The substitution of steam propellers for the sailing sloops, will secure a protection to oyster beds and oyster farming, that can be realised, provided our recommendations are lawfully enforced by legislative acts and by the selection of a commander and subordinates of nautical intelligence and experience.

The surveys of water lots for oyster farms can be correctly made only by such persons as are familiar with the use of the sextant or circle for measuring angles, and the solution thereof, and such duty should be performed by the commander and other officers of the Fishery Force at no additional expense to the State.

An appropriation of money by the Legislature is recommended elsewhere for the survey and equipment of the steam propellors.

The manner of selecting officials for commissions in the State Fishery Force and the inducements to secure good and desirable persons to serve, are treated of elsewhere.

Be it enacted by the Senate and House of Delegates of Maryland, That on and after the..... day of.....next the following rules and regulations be adopted and put in form for the government of the "Department of the Chesapeake:"

Article 1. The commanders of vessels are strictly enjoined and required to be vigilant in discharge of their duty, obedient to all orders emanating from their commanding officer, and to guard against and suppress all dissolute practices.

Art. 2. Any officer or other person who shall be guilty of drunkenness, neglect of duty, disobedience of orders, or any scandalous conduct tending to the destruction of good morals, shall, if an officer, be dismissed the service by order of the Governor of the State.

By the comptroller's report there are in the State treasury to the credit of the oyster fund $239,946.40. Balance September 30, 1883. We recommend the building of five (5) additional steam propellor vessels, and we would suggest that they can be more cheaply built in the aggregate than singly. A sum of $200,000 should be appropriated out of the oyster fund or any other money in the treasury unappropriated, and as much as may be required thereof should be expended in payment of the propellors and their equipment; the hulls to be "composite" construction and built in the strongest manner and of the best material; to be schooner-rigged and furnished with "Herrshoff's improved compound condensing engine and latest type Hershoff's patent safety boiler." These engines and

boilers are in the market—same as recommended by the Board of United States Naval Engineers. All out-board metal, such as screws, rudders, sternbearing and shoe, to be of the best bronze. The propellors to make a speed of twelve knots per hour before acceptance, and to be equipped (each) with two quarter boats, two bow anchors and chains; sails, rigging, awnings and awning stanchions of iron pipe, and all engine-room tools, and to be fitted with one brass howitzer each, weight not to exceed 500 lbs. Propellors, while building, to be under the supervision of State authorities, and examined after built for acceptance. If the vessels are accepted by the State authorities, the builder shall deliver them at Annapolis, and each boat to be paid for when delivered. The size of the steam propellors shall be in demensions as follows:

Two 98 ft.x17½ ft.x8½ ft. deep; draft of water about 6 ft.

Two 110 ft.x18 ft.x8½ ft. deep; draft of water about 6 ft.

One 130 ft.x23 ft.x10 ft. deep; draft of water about 7½ ft.

The propeller of 130 feet length to be furnished with a steam launch for surveying and other purposes.

The vessels should be equipped with appliances which could easily and quickly be brought into active use in every emergency for protection against accidents incident to nautical exposure, rendering the vessels capable of protracted cruising in the Chesapeake Bay in the execution of a duty which should be conducted with diligence, intelligence, activity and firmness, especially *during* the *night time* as well as during the day time. It is during the night time marauders reap their golden harvest. There is nothing in the present organization of the "State Fishery Force" to recommend it to generous or honorable consideration or to stimulate the ambition of its personnel. The officers and crew are selected for political considerations, and patronage continues during the political usefulness of said officers and crew by a majority vote of the "Board of Public Works." The force can never be useful in protecting the oyster beds, without being make efficient. An intelligent reorganization is the only hope, while under the present control it has gone from bad to worse. Three good generals are worse than one bad general. The Governor, who is made by the Constitution of the State the commander-in-chief of the military of the State, should have control of the "Department of the Chesapeake." The Captain commanding the "Department of the Chesapeake" should be, to the Executive of the State, like the Adjutant-General and a member of the Governor's staff. The Captain commanding the "Department of the Chesapeake," should be an experienced seaman of professional and educational qualifications, and he should be commissioned by the Governor, by and with advice and consent of the Senate of the State as Captain or Commissioner commanding the "Department of the Chesapeake," and said commission shall be for life or during good behavior, and all persons selected for their qualifications to fill official positions, should be also commissioned by the Governor, by and with the advice and consent of the Senate of the State, and the so commissioned officials shall hold their commissions for life or during good behavior. The Governor should select an experienced engineer of educational qualifications, who, together with the Captain commanding, shall constitute an examining board, before whom all candidates seeking official positions must report for examinations. Said examining board will make recommendations to the Governor of all who have been examined, within the time provided for said examinations, for the Governor's action; and in the absence of the Senate the Governor can issue commissions, subject to the approval of the Senate in session. As inducement to good conduct and faithful observance in discharge of all duties pertaining to officers, promotion in the service of the "Department of the Chesapeake," should be established by law, and whenever vacancies in the higher grades occur, those officers of subordinate rank who have shown aptitude, zeal and professional qualification in performance of duty, shall be promoted to fill said vacancies; and when other vacancies occur in the lower grades of officers, such vacancies may be filled by any of the crew who are found qualified to fill said office. Such lawful

provisions would elevate the service, cost the State no more money, and it would command the best talent and intelligence among the seamen and engineers, and the State would reap a solid benefit.

Further organization suggests that any officer guilty of insubordination, neglect of duty, drunkenness, disqualifications from any cause whatever, or conduct tending to the destruction of good morals, shall be dismissed the service by the Governor; any other persons guilty of any of the above irregularities, abuses or offences may be dismissed the service by the captain commanding, who shall investigate all charges and specifications to charges, and if in part or in whole said charges and specifications to charges are sustained by evidence, the same shall be transmitted to the Governor for his action.

A code of night signals should be introduced in order to facilitate the transmission of important intelligence to the commanders. A code of day signals should be introduced for the same purpose. All sailing vessels belonging to the "State Fishery Force" should be sold and no more of them should be bought. Exposure to the winter weather, nowhere more severe than on the Chesapeake Bay, especially after night, is very severe on people engaged in this service, and in consideration thereof the salaries recommended are only just if compared with other salaried officials of the State who are not subjected and exposed to the rigorous ordeal. The State should ration the personnel of their service, and the captain commanding should regulate the commissary department. "The pay-roll of each vessel should be kept at the office of the Oyster Commissioners and the officers and men paid there."

The "Department of the Chesapeake," under the suggested reorganization, could furnish the scientific and practical intelligence required for the surveys of the oyster beds and would aid in the development of this industry by completing the work in that direction that the State could desire or development of the enterprise require. The officials making the surveys would acquire a knowledge of the locality of the oyster beds from observation and would more knowingly perform the duty of protection. Surveys could be done from May to October in each year until completed and during the winter months results ascertained.

The State Oyster Commission had the use of the Herrshoff steamer, "The Governor W. T. Hamilton," and Capt. Waddell, who commanded her during the months of May, June, July and August, of the year 1883, reports that her total consumption of coal for all purposes per month did not exceed five (5) tons. We, therefore, feel it our duty to recommend Herrshoff's engine and boiler for the vessels indicated, to the exclusion of all others. The remarkable economy in fuel, the safety from explosion, the rapidity in steam-getting, make the boilers very desirable. The expense in coal supply is as $35 to $120 per month, and in a few years the economy in consumption of coal alone will pay for the vessels.

The captain commanding the "Department of the Chesapeake," shall cause to be erected at each sectional terminus, unless a natural or artificial terminus exists, a beacon, on which shall be inscribed the compass bearing and "State Oyster Commission."

The points indicated for beacons are established by the latitude and longitude of such points, and are here furnished:

WEST SHORE.

Latitude 39° 13′ 30″ Longitude 76° 23′	*Lighthouse.*
Latitude 38° 59′ Longitude 76° 25′ 18″	*Hackett's Point.*
Latitude 38° 54′ 25″ Longitude 76° 27′	*Thomas' Point.*
Latitude 38° 46′ Longitude 76° 32′	*South end Parker's Island.*
Latitude 38° 43′ 40″ Longitude 76° 31′ 10″	*Holland Point.*
Latitude 38° 23′ Longitude 76° 30′ 45″	*Parker's Point.*
Latitude 38° 32′ Longitude 76° 22′ 40″	*Cove Point Light.*
Latitude 38° 08′ 20″ Longitude 76° 19′	*Point No Point.*
Latitude 38° 02′ 10″ Longitude 76° 19′	*Point Lookout.*

EAST SHORE.

Latitude 39° 13′ 15″ Longitude 76° 14′	*Creek Mitchell's Bluff.*
Latitude 39° 07′ 20″ Longitude 76° 16′ 30″	*Swann Point.*
Latitude 38° 58′ 30″ Longitude 76° 20′ 15″	*Broad Creek, South Point.*
Latitude 38° 53′ 15″ Longitude 76° 21′ 40″	
Latitude 38° 47′ Longitude 76° 23′	*North end Poplar Island.*
Latitude 38° 42′ Longitude 76° 20′ 30″	*North Point Paw Paw Cove.*
Latitude 38° 31′ 50″ Longitude 76° 20′ 45″	*James Point.*
Latitude 38° 25′ 30″ Longitude 76° 17′ 25″	*Creek.*
Latitude 38° 13′ 30″ Longitude 76° 04′	*Hooper Strait Lighthouse.*
Latitude 38° 02′ 50″ Longitude 76° 30′	*Solomon's Lump Light.*
Latitude 38° 07′ Longitude 75° 56′ 45″	*Little Island.*
Latitude 38° 13′ 45″ Longitude 75° 58′	*Clay Lighthouse.*

Complement of Officers and Men for a 98-foot Steam Propeller.

1 Commander,	at $100	per month,	per year	$1,200	2 Seamen,	at $25	each, per month, per year	$600
1 Pilot and 1st Officer,	70	" "	"	840	2 Boys,	10	" " " "	240
1 Pilot and 2d Officer,	60	" "	"	720	1 Steward,	25	" " "	300
2 Machinists,	70	each," "	"	1,680	1 Cook,	20	" " "	240
2 Firemen,	30	" " "	"	720				

For 100-foot Steam Propeller.

1 Commander,	at $100	per month,	per year	$1,200	2 Seamen,	at $25	each, per month, per year	$600
1 Pilot and 1st Officer,	70	" "	"	840	2 Boys,	10	" " " "	240
1 Pilot and 2d Officer,	60	" "	"	720	1 Steward,	25	" " "	300
2 Machinists,	70	each "	"	1,680	1 Cook,	20	" " "	240
2 Firemen	30	" " "	"	720				

Complement of Officers and Crew for a 130-foot Steam Propeller and Launch.

Commissioner Commander of the Navy.—

1 Pilot and 1st Officer,	at $80	per month,	per year	$960	2 Seamen,	at $25	per month each, per year	$600
1 Pilot and 2d Officer,	60	" "	"	720	2 Ord'y Seamen,	18	" " "	432
1 Engineer (Chief,)	100	" "	"	1,200	2 Boys,	10	" " "	240
2 Machinists,	70	each, "	"	1,680	1 Steward,	30	" "	360
2 Firemen,	30	" " "	"	720	1 Cook,	25	" "	300

We would suggest the smaller steamers now in service can be made efficient by the following changes:

1 Commander,	at $100	per month,	per year	$1,200	1 Seaman,	at $25	per month, per year	$300
1 Pilot and 1st Officer,	70	" "	"	840	2 Ord'y Seamen	20	each, " "	480
1 Pilot and 2d Officer,	60	" "	"	720	1 Cook	20	" "	240
2 Machinists,	70	each, "	"	1,680				

CHAPTER IX.

The Minority Report of Wm. Henry Legg.

"*To the Honorable the General Assembly of Maryland:*"

"The undersigned, being a member of the State Oyster Commission, and being unable to agree in all the views and suggestions as reported by the majority of said commission, begs leave respectfully to present some views in a minority report."

"The undersigned is not fully in accord with the majority report in the belief 'that the oyster property of the State is in imminent danger of complete destruction.' This is not likely, unless we fail to give the interest even ordinary care and protection. Whilst in some localities the beds have been greatly depleted by overwork, and in others destroyed, chiefly in shallow water tonging ground, the beds and bars as a rule have been greatly enlarged by working them, and the quality of the oysters much improved if given a longer period of growth before being taken to market. It is probable that no oyster bar in the waters of our State, ever of any size or importance is so run down or reduced, if not wholly destroyed, as to be unable to recuperate and recover now, if given proper protection and rest. The oyster supply of our waters, taken as a whole, it is likely is as large as ever it was, but is gathered from larger fields and by more laborers. The last season was probably unprecedented as a good one for spawn and the catch of spat. The oyster ground all over the State is literally covered with young oysters of this last season's growth. Great Rock, in Tangier Sound, that the commission visited in the fall of 1882, and examined, and found oysters of any class so scarce that the commission then thought the rock or bar beyond recovery, is again alive and covered with young oysters. The oysters from there and also the neighboring waters sold to the Crisfield packers are covered with young, growing, healthy oysters, as many as seventy having been counted on an oyster of medium size. Pocomoke Sound, a few years since, (in 1880,) was so depleted that many neighboring oystermen say a bushel a day was an average day's work. The Legislature passed a law giving it absolute rest for a year or so, and the beds were again replenished, and with oysters of fine quality. Tongers this season from these beds have reaped a rich harvest, making from ten to twenty dollars some days. Natural beds and bars cannot be greatly improved by human industry unless they have been so depleted as to be unable to recuperate. What they need is proper rest and protection. To give these, in the opinion of the undersigned, we will need no very large, cumbersome and expensive navy, with its large fleet of sail vessels and steamers, its high-salaried commanders and numerous crew, or any costly change, as compared with our present system. To obtain necessary, proper and efficient protection the undersigned believes it to be all-important first, by concurrent legislation with Virginia, to prohibit dredging in the waters of the Potomac, or place it under the control and restrictions of law; to further limit or shorten the time of dredgers and scrapers, and to limit the size and weight of dredges; to compel the return of the young and unmarketable oysters to the beds and bars, together with clutch, when and where taken; to make more certain and severer the penalties for violations of the oyster laws; to prevent summer planting during the spawning

season, or of taking the oysters from their natural beds during that season for any purpose. These measures are all, or nearly so, in the opinion of the undersigned, necessary for the replenishing of our natural beds and bars. Being a member elect of the Legislature, he deems it unnecessary here to state his reasons for these views, or to state how he thinks they can best be carried out, expecting to have the opportunity there when a member of that body."

"The undersigned agrees with his colleagues in the importance of oyster-planting and oyster-farming, as a means of increasing our oyster supply, but is uncompromisingly opposed to the leasing or selling of any of our natural beds and bars to any person or persons, for any purpose or purposes. In Connecticut and other northern States that have increased their oyster supply so largely by these means, one restriction has always been jealously insisted upon, viz., that natural beds or bars should not be set apart or designated for planting or cultivating oysters. Some of these States have gone so far as to refuse to set apart land for these purposes if there has been on it natural beds and bars for ten years past. If any oyster commissioner allows the appropriating or designating of natural beds and bars, they are visited by heavy fines and penalities and the grants declared invalid. We should do as they do, go that far and no farther: grant, under proper restrictions, bottom lands suited to the cultivation and growth of oysters for bedding and farming purposes, but none that have any natural beds or bars. We have many thousands of acres in our waters barren of oysters, as well or better adapted to the growth of oysters and their cultivation as can be found in New York, Connecticut, Rhode Island or elsewhere, and it is here we should plant and farm, and nowhere else. By this means we would utilize waste land, greatly increase our oyster supply and the State's revenue."

"The oysters of the State belong to the people of the State, and the true policy of the State is to guard and protect our oyster grounds for the benefit of its citizens. For the protection given the State should receive an ample revenue. The citizens of the State have the right to ask and expect that legislation be in the interest of the many, not of the few; in the interest of the weak rather than the strong, and to demand that this vast public domain—the oyster grounds—shall be held now and for all time to come, as it ever has been held, as a great commons, to be used in common by the citizens of the State under such rules and regulations as the State may prescribe, and not sold to a few capitalists, thereby making the rich richer and the poor poorer. The undersigned is opposed to districting the bay, as proposed by the majority report, believing that protection under such circumstances would not only prove a failure but burdensomely expensive to the State. He has no fears but what the present oyster supply will be kept up to its present standard and within a few years increased. The supply is now greater, probably, than ever before, and the prices higher, take the season through. It is the increased demand and consequent high prices that has created the oyster panic in the public mind to a great extent."

"To show that our oyster grounds are not yet unproductive it is but necessary to compare the crop gathered at two or three of our important oyster markets the present season with former ones. Baltimore in the season ended in 1880, with its then 45 packing-houses, is reported to have used at these houses alone 6,450,202 bushels. From carefully gathered statistics the last season she is given with her now 67 packing-houses, 14,000,000 bushels. Crisfield in 1880, 427,270 bushels; in the last season, ended in 1883, 1,200,000 bushels. Cambridge in 1880, 218,510 bushels; in the last season, 600,000 bushels. The undersigned thinks these figures are as correct as can possibly be obtained, and from other data he has personally gathered and has in his possession, he thinks the comparison would hold good as a rule at nearly all of the chief oyster markets of the State. The majority report is so elaborate and full, giving all necessary information, facts and figures, and in the main having the endorsement and concurrence of the undersigned, that he thinks in this report it would be superfluous to say more."

"In conclusion, he hopes it may not be misunderstood in briefly alluding to the interest he now feels and has always felt in the production of this important industry. In 1868, as a member of the Legislature and as chairman of a select joint committee, he reported the bill that gave birth to our oyster navy in the interest of protection. In 1880, as a member of the same body and as chairman of a select committee, he reported the present State oyster law. In 1882, under joint resolution of the General Assembly, he was by Governor Hamilton appointed one of the three State oyster commissioners. In that capacity in 1882, with his colleagues, he visited and examined many of the beds and bars of the State. In 1883, he, by agreement of the commission, devoted his time to the tidewater counties, visiting many, holding meetings, giving views, obtaining views and seeking statistical information, besides a correspondence carried on with several hundreds of persons of different classes in different parts of the State."

"Respectfully submitted,"

"WILLIAM HENRY LEGG,"

CHAPTER X.

THE OYSTER INDUSTRY AND OYSTER LAWS OF MASSACHUSETTS, RHODE ISLAND, CONNECTICUT, NEW YORK, NEW JERSEY, DELAWARE AND VIRGINIA.

The resolution under which we were appointed requires us to submit to the General Assembly all information which will aid it in devising laws for the protection of our oyster industry, and as one important source of this information is found in the laws and methods which have been employed in other parts of our country, we will give in this chapter a short sketch of this subject and copies of the most important and instructive laws.

Some of these laws are instructive on account of their value, while others are instructive only because they have failed to result in any benefit to the industry, but we believe that the entire chapter will be found to contribute materially to an intelligent grasp of the subject

We have been aided in the preparation of this chapter by the Fish and Oyster Commissioners of several States, notably those of Rhode Island and Connecticut, and we have also derived much valuable information from Ingersoll's "Report on the Oyster Industry of the United States," and also from the "Sea World," a weekly newspaper, edited by W. B. Hopson, of Baltimore.

Section 1.—The Oyster Laws of Massachusetts.

The following account of the oyster laws of Massachusetts is condensed from Ingersoll's "Report on the Oyster Industry of the United States."

This State allows any inhabitant to take oysters in the day time from September first to June first for family use, but some of the towns have special laws limiting the quantity which may be taken for this purpose to one bushel a week for each household, while other towns permit only three bushels to be caught in a month.

GENERAL LAW.

Whoever takes oysters, wilfully destroys oysters, or obstructs their growth, forfeits $2 for each bushel, including shells.

The mayor and aldermen, or the selectmen, of any city or town may give permits to any person to take a stated quantity of oysters; and any inhabitant may, without permit, take oysters, for family use, from September 1st to June 1st.

Any boat, not owned in the place, and found with oysters on board, not taken under a permit or license, may be seized and detained by any inhabitant, for not more than 48 hours pending process of law.

The mayor and aldermen, or selectmen, of any city or town may grant a license, for a term not exceeding twenty years, to any inhabitant thereof, to plant, grow and dig oysters, at all times of the year, upon and in any flats or creeks therein, at any place where there is no natural oyster bed; not, however, impairing the private rights of any person, nor materially obstructing the navigable waters of any creek or bay. But no person shall take any oysters from any flats or creeks for which a license has been granted between sunset and sunrise, on penalty of forfeiture of license, and the oysters on his beds.

Such license shall describe the waters and bounds, shall be recorded, and shall cost the applicant $2.50.

The person so licensed, his heirs and assigns, shall, for the purposes aforesaid, have exclusive use of the flats and creeks described in the license, during the time therein specified; and any person who, without consent of the owner, removes oysters from licensed ground, incurs a fine of $100 or less, or imprisonment from thirty days to six months, or both.

SPECIAL LAW.

Town of Sandwich.—If any person shall take any oysters from their beds or destroy them therein, in the town of Sandwich, except as hereinafter provided, he shall forfeit for every bushel of oysters so taken or destroyed, the sum of five dollars; *Provided, however*, that the selectmen of said town may give permits in writing to any inhabitant to take shell fish at such times and for such uses as they shall think reasonable, not exceeding two bushels for one family, and the use for which the oysters may be taken shall be expressed in the permit; *Provided, further*, that any inhabitant of said town may, without permit, take one bushel of oysters per week from their beds in said town, for the use of his or her family, from September 1st to June 1st annually.

Any person entitled to one bushel of oysters per week, may, by an order, empower another person to take said bushel of oysters for his or her family use.

Town of Wellfleet.—No person not an inhabitant of the town of Wellfleet, shall take any oysters within the waters of said town without a permit from the selectmen, nor shall any person, being an inhabitant of said town, take any oysters for the purpose of selling them without a permit from the selectmen, who may grant the same for such sum to be paid to the use of the town as they shall deem proper, but the inhabitants of said town may take oysters for family use without a permit.

Violation of this act shall be punished by a fine of not less than five nor more than ten dollars, and cost of prosecution, and one dollar for every bushel of oysters so taken; said fine to be recovered by indictment or information before a trial justice in the county of Barnstable.

Town of Somerset.—The town of Somerset shall have the exclusive control of the oyster fishery in that part of Taunton River within the limits of said town, and may sell at public or private sale the right or privilege of taking oysters for a term of not less than three nor more than ten years at any one time; and all money arising from such sale or sales shall be paid to the treasurer of said town for its use. Any householder may take three bushels of oysters each month without a permit.

Town of Swansea.—This town has a special law similar to that of the town of Somerset.

The towns on the Taunton River and its tributaries lease their lands to stock companies under these local laws, and these companies work the natural beds for seed oysters, which are sent to a distance to be sold for planting.

The town of Somerset leases to the Somerset Oyster company, composed of citizens of the town, for a period of five years, at an annual rental of.....$ 800
Fall River leases to a firm in Wellfleet for..... 600
Freetown to a citizen of Rhode Island for..... 1,000
Deighton to another citizen of Rhode Island for..... 475
Assouet to a Rhode Island company for..... 1,225
Berkley to a Rhode Island company for..... 1,300

These leases give the right to the natural beds, although the right of each citizen to catch oysters for family use is reserved under the State general laws.

There is no planting in the river, and the industry consists in the working of the natural beds for seed oysters, which are sold to distant planters. The bottom is annually shelled with from 25,000 to 30,000 bushels of oyster shells, and it yields about 51,000 bushels of seed oysters for sale. The people along its shores also get all the oysters they want for family use, and, in addition to the

$5,400 which is paid them each year for the rent of the beds, they also receive about $17,500, which is paid them in wages for service in dredging, tonging and transporting for the lessees of the beds. As the oyster area is only about eleven miles long, and covers only a small area, it will be seen that the system is extremely profitable.

The town of Wareham.—Fifty years or so ago this town leased to a company the privilege of taking oysters from its natural beds, but it annulled the contract in 1840 on the ground that the company was exhausting the beds, as the practice of shelling the beds does not appear to have been employed.

The town has divided the bottoms of its rivers and inlets into grants of about two acres each, which are leased for oyster planting for a term of twenty years at $2.50 each, and taxed on a basis of $50. Nearly all these grants, about 125 in number, are taken up, and the lands have been planted with seed oysters taken from the natural beds of the town.

In 1874 the town voted that no one should be allowed to fish for oysters on the natural bed without paying to the town a duty of ten cents a bushel. For three or four years the town derived considerable revenue from this source, but the law has excited opposition, and has led to the abandonment of the business, so that the revenues are now very small.

Section 2.—Oyster Industry and Oyster Laws of Rhode Island.

In this State the oyster law is based upon the principle that all property below high-water mark is the public property of the whole State, and is to be administered in such a way as to secure the greatest good to the greatest number of its citizens, and the laws and methods in force are the results of a general policy which has been carefully matured and perfected. Under this wise administration the beds are now more valuable than they would be if they were left to nature, and their value is steadily increasing.

Your commissioners are indebted to N. P. S. Thomas, of Providence, the shell-fish commissioner of Rhode Island, for most of the information here given, and we have also made extracts from Ingersoll's report on the "Oyster Industry of the United States."

The oyster area of the State is in part leased to private holders, and in part open to the public.

The public beds are open to citizens of Rhode Island in the daytime, between September 15th and May 15th, except certain beds, which are open only from April 1st to June 15th, but no person is allowed to take more than ten bushels of oysters a day, under a penalty of $20. No one is allowed to take oysters from the public beds with any instrument except tongs or under-rakes, under penalty of $300 fine and the forfeiture of the boat and all apparatus used, and the under-rake is defined by statute as follows: 'the handles of said rake being 15 to 20 feet in length, the head from 1 to 2 feet in length, filled with iron teeth from 6 to 10 inches in length, and mostly used through holes cut in the ice.' All shells and all small oysters unfit for market, are required to be returned to the beds, under a penalty of $20 fine for each offence, and the forfeiture of the boat and all apparatus used, and there is the same penalty for taking oysters at night. Any person who wilfully damages any public bed, by dumping upon it, or in any other way, incurs a penalty of $500 fine for each offence. No person who is not a citizen of Rhode Island is allowed to catch oysters on any public bed, under a penalty of $20 fine for each offence, and the forfeiture of the boat and all apparatus used; and a person who is convicted of a second offence against the oyster laws, forfeits for three years the right to catch oysters.

There are three oyster commissioners, elected for five years by the Legislature, and they have the power to buoy off and close any oyster bed when they think it is becoming exhausted, or any new bed which may be discovered, and the taking of oysters from any beds thus closed, or the disturbance or injury of the buoys is punished by a fine of $20 for each offense, and the forfeiture of the boat and all apparatus.

THE PRIVATE OYSTER FISHERIES OF RHODE ISLAND.

The laws regarding the appropriation of ground for the private cultivation of oysters in Rhode Island are still in a somewhat tentative condition, and many great changes will, no doubt, be found necessary in the immediate future. They are, however, the result of a wisely matured general policy, and as they have within a few years greatly increased the supply of oysters, the amount of capital invested in the State, and the revenue from the oyster grounds, they are well worthy of careful study.

The private grounds are held under two distinct acts, one of long standing to encourage oyster planting, and another, passed in 1883, to develop an oyster-farming industry like that of Connecticut. The shell-fish commissioners state, however (December 9, 1883), that the industry has far outgrown all the existing legislation, and that essential changes will be recommended to the Legislature this winter.

OYSTER PLANTING LAWS.

The three oyster commissioners, who are elected by the Legislature for a term of five years, have power to lease, by public auction or otherwise, to any inhabitant of the State, any land below low-tide mark, whether it be a natural oyster bed or not, to be used as a private oyster fishery, for the planting and cultivation of oysters, upon such terms and conditions as they may deem proper, but not for less than five nor more than ten years, and the rental is fixed by law at $10 annually for each acre.

The law at present does not permit the leasing of more than one acre in one lot or parcel to one person or firm, but strict adherence to this provision is avoided by common consent, and when there is no opposition, several acres are leased in one lot, the commissioners wording the lease as follows: "This land is leased in parcels of one acre each, but included in one lease for convenience," so that there is practically no limit to the number of acres one person may hold, and the average, in 1879, was 17 2-10 acres to each holder.

In its present form the law does not allow any one except an inhabitant of the State to lease land, and in 1879 the discussion of the question, who were suitable persons to receive leases under this proviso, led to a contest before the Legislature. It was well known that many Boston dealers planted oysters and carried on a business in oysters upon ground leased in the name of some inhabitant of the State, who might or might not act as their agent.

As the native fishermen held that this practice was an injury to them and an infringement of the law, they endeavored to procure the passage of a bill making it a misdemeanor for any lessee of oyster beds to be interested with any person not a resident of the State, under a penalty of $100 fine and cancellation of the lease. This bill failed to become a law, however, and in 1880 one-third of the capital of $1,000,000, which was invested in the oyster industry of the State, was owned in Boston.

The oyster commissioners are required to publish applications for leases, and before granting a lease to have the ground surveyed and platted, and to cause proper bounds to be set up on the shore in order to define the limits of the leased area, and to see that the leased area is inclosed by stakes or buoys not more than two rods apart, unless this shall interfere with navigation, and to have the plats of all leases bound in a book. The lessee is required to pay all the expenses thus incurred, and also to pay the commissioners $1.50 per day and their necessary expenses.

The commissioners have the power to modify or cancel leases, and to remit rent in certain cases. They are required to see that the terms of the leases are properly fulfilled, and that rents are punctually paid, and in case of failure, they must terminate the leases, and they may resell at public auction any lot upon which the rent has not been paid, with all the oysters upon it, after a week's notice has been given in some newspaper printed in Providence.

The oysters planted or growing in any private oyster ground leased by the commissioners, are, during the continuance of the lease, the private personal property of the lessee, and the taking and carrying away of such oysters by any unauthorized person is larceny, and is punished by the forfeiture of the boat and of all the implements used, and by a fine of $50 for the first offence, and by a fine of $100 and

imprisonment for six months for each subsequent offence, and the owner of the oysters stolen also has a private action for damages against the thief.

Wilful injury to any private oyster bed, or to any land leased for oyster culture, is punished by a fine of $500 and by forfeiture of boat and of all apparatus, and tampering with boundaries is punished by a fine of $20 and by double damages.

The holders of private oyster grounds are not allowed to fish at night, under a penalty of $20 fine and the forfeiture of boat and apparatus; and any one convicted of a second offence against the oyster laws, loses the right to catch oysters for three years.

The commissioners and all police constables have power to enforce the oyster law and to seize the property of those who violate any of its provisions.

The oyster cultivation of this State is almost entirely oyster planting, and most of the seed oysters are purchased outside of the State, although steps are now being taken to establish a farming industry in the deep waters, like that of Connecticut.

OYSTER FARMING IN RHODE ISLAND.

In his message to the General Assembly in January, 1883, Governor Littlefield says:

"The shell fisheries department has shown a steady increase in receipts from year to year. The commissioners have paid into the treasury for the year 1882 the sum of $9,741, and they estimate the income for the ensuing year at upwards of $10,000. It is evident that this industry, if properly developed and nurtured, may be the source of large profit to the people of the State. Even the empty shells, which a few years since were deemed almost worthless, have now a commercial value. I am informed they sell for from two and one-half cents to six cents per bushel for shipment to our neighboring State of Connecticut, where they are planted in the waters of Long Island Sound. Here the young oysters form on the shells so planted, and in from one to two years these shells, with the 'set,' as it is termed, are sold to be replanted in our own waters, realizing from forty to sixty-five cents a bushel. There would seem to be no good reason why these shells should not in the first instance be utilized in the waters of our own bay and its tributaries, and I am informed that experiments are being contemplated by our commissioners with this end in view."

"The commissioners deem it important that some change should be made in our present statutes, relative to the shell fisheries, the industry having in some respects outgrown the present legislation, which was adapted rather to the development than to the regulation of the system. For this purpose they will submit some amendments, which, in their judgment, will accomplished the desired end."

And the Shell-Fishery Commissioners, in their annual report of the same date, made the following recommendations:

"There is an increase of income to the State for the rent of ground for the planting and propagating of oysters from year to year, for many years past, and we see no reason why this increase should not continue for many years to come. The legislation of the State has not only had a tendency to produce quite a revenue to the State, but to encourage a very profitable industry within the State, and giving employment to both labor and capital. By industry and attention to this branch of business, the lessees have not only added to the State both industry and money, but have produced oysters for the market at a much less price than they could have been purchased had not said industry been fostered and protected by legislation."

"The present law requires the lessee to procure a plat of the ground to him leased, at his own expense. This, heretofore, when but little ground to him was leased, was probably a wise and just provision of the law but at the present time it seems no more than just that the State should pay the expenses of surveying and platting the ground so leased, because the plats could be made under one contract by the State for a much less sum than they could be furnished by individuals in small detached sections, and this would enable the State to have at all times in the office of the commissioners a uniform set of plats under the control of said commissioners, which could be referred to at any time for the purpose of better

locating land unleased as well as land already leased, and the surveyor designated by said commissioners could very easily direct any alterations in the boundary lines of said lands."

"In the opinion of the commissioners a law should be passed allowing parties to rent land covered by tide water of a depth not less than twelve feet at low tide, at a small rent, for a term not less than five nor more than ten years. We see no reason why the seed oysters could not be as readily raised in our waters as the waters of other States, thus building up a very large and profitable industry within this State."

And in accordance with these recommendations the General Assembly passed in January, 1883, a law giving the commissioners the power to rent, at an annual rental of not less than $1 an acre, for a term not exceeding five years, any lands not already leased and covered at average low water by at least twelve feet of water, for the purpose of experimenting in the cultivation of oysters, and they also provided for the survey of all such lands at the expense of the State. There is no limit to the amount that a person may hold under the law, and natural beds may be appropriated, but the most valuable natural beds are reserved under other laws, and the commissioners have declined to lease natural beds when, in their judgment, it is for the interest of the public to have them remain free or common.

In a letter dated December 9, 1883, the commission states that about 1,100 acres are now leased for oyster culture, from which about $11,000 will be due to the State Treasury on January 1, 1884, and in addition to this about 300 acres have been leased for raising seed at $1 an acre under the new law, and this area will undoubtedly be greatly increased in the spring of 1884.

Our own State, with nearly 1,000,000 acres valuable oyster bottom, has never derived a revenue of much more than $50,000 a year from this service, and it hardly seems as if comment upon this fact would be necessary, as any one can make the simple computation which will show the inefficiency of our present policy as compared with that of Rhode Island.

Section III.—The Oyster Fishery and Oyster Laws of Connecticut.

The methods employed in this State are of the greatest interest, for Connecticut has been able, by the adoption of a wise plan, to build up a great oyster industry in a very short time, and to place the business upon a sound and substantial foundation.

The natural resources of this State are as nothing compared with the resources of our own waters, for, upon the most liberal estimate, her natural beds do not exceed 5,000 acres, all told, while, according to Lieut. Winslow's careful survey, the waters of Tangier and Pocomoke Sounds alone contain 130 square miles of natural beds.

The 5,000 acres of natural beds furnish few marketable oysters, and are chiefly valuable as a supply of seed oysters for planting; but they are by no means large enough to furnish all the seed which is used by Connecticut planters, and as recently as 1881 hundreds of thousands of oysters were annually taken from the Chesapeake Bay to be planted in the waters of Connecticut. According to Ingersoll, 450,000 bushels of Chesapeake Bay oysters were planted in the vicinity of New Haven in 1879, and 65,000 bushels in Eastern Connecticut, or 515,000 bushels in all.

Three years of efficient protection, under wise oyster laws, have produced such a change that the State which was so recently compelled to purchase oysters for planting has, as we are informed by good authority, this year furnished seed in considerable amounts to New York, Rhode Island and New Jersey, besides sending an immense supply to European planters. One firm shipped, in the spring of 1883, sixty car-loads of seed-oysters to San Francisco from the beds of Connecticut. The sixty car-loads, or more than 15,000,000 young oysters, had been engaged by persons employed in planting on the Pacific coast.

A method which is capable of producing such a result as this in three years' time is worth most careful examination, and we shall therefore give a minute account of the oyster policy of Connecticut, and a copy of her oyster law in full. (Want of space has compelled us to omit this law).

The waters of the State are divided into two districts, a shore district, which is under the immediate care of the various towns which border upon the water, a Connecticut town corresponding in a general

way to a Maryland county; and a deep-water area which is under the exclusive jurisdiction of the State, and is managed by a board of three paid oyster commissioners, who are appointed for a term of three years by the Governor, with the advice and consent of the Senate. In each area there are natural beds, which are open to the public, and private grounds, which are appropriated to individuals or companies, by law, for the cultivation of oysters.

THE PUBLIC BEDS OF CONNECTICUT.

The natural beds are open to all residents of the State at all times except at night, but no one is allowed to use a steamboat upon them, or to use a dredge which weighs more than thirty pounds.

The use of steam vessels for dredging upon public beds has only recently been prohibited. Steam vessels are used upon the private oyster beds, and the proposition to close the public beds to them was warmly attacked, but was finally adopted and made a law by the Legislature in 1881.

"In gathering seed near shore, and somewhat otherwise, tongs and occasionally rakes (those with long curved teeth) are used; but the marketable oysters are nearly all brought from the bottom by dredges of various weights and slight differences in pattern. In the case of all the smaller sail-boats, the dredges having been thrown overboard and filled, are hauled up by hand—a back-breaking operation. The oysters themselves are very heavy, and frequently half the amount caught is composed of shells, dead oysters, winkles and other trash, which must be culled out, thus compelling the oystermen to twice or thrice the work which they would be put to if there were nothing but oysters on the ground. The work of catching the oysters by any of these methods is, therefore, very tiresome and heavy, and various improvements have been made, from time to time, in the way of labor saving, from a simple crank and windlass to patented complicated power-windlasses, similar to those commonly used in the Chesapeake boats. When a proper breeze is blowing, dredging can be accomplished from a sail-boat, with one of these windlasses, with much quickness and ease. In a calm, or in a gale, however, the work must cease, as a rule."

"Under these circumstances, and as the business increased, it is not surprising that the aid of steam should have been enlisted; nor, perhaps, is the controversy which has ensued to be wondered at, since the introduction of novel or superior power into some well-traveled walk of industry, has ever met with indignant opposition."

"The first utilization of steam in this business, so far as I can learn, was by Capt. Peter Decker & Brother, of South Norwalk, about 1870."

"After the Messrs. Decker's experiment, Mr. W. H. Lockwood, of Norwalk, not an oysterman, but an enthusiastic believer in steam-dredging, built the steamer Enterprise expressly for the business. Her length is 47 feet; beam, 14 feet; she draws 4 feet of water. She handles two dredges; has a daily capacity of 150 to 200 bushels."

"These were followed by several other steamers."

"The Merwins, of Milford, and Mr. Wheeler Hawley, of Bridgeport, also have steamers of large capacity, so that there are now in all seven in Long Island Sound, but it is generally acknowledged that the most thoroughly equipped boat for this purpose, of the fleet, is owned by H. C. Rowe & Co., of Fair Haven, Connecticut. It is named the 'William H. Lockwood,' and is comparatively new, and cost between six and seven thousand dollars. The dimensions of this boat are: length, 63 feet; beam, 16 feet; draught, 5½ feet. Her boiler is larger and her engine more powerful than usual in a boat of her size, and she can therefore be used for towing, and can force her way through heavy ice in the winter, so that her owner is sure of a supply of oysters for his customers when other dealers may be unable, with sailing-vessels, to get them. Besides her regular propeller, she has a double engine for hauling dredges, which hauls all four dredges full of oysters at once, and lands them on deck, two on each side, at the rate of 800 bushels a day, if needed. This employs a crew of ten men, who are protected from the weather by a housing which covers in the whole deck."

Connecticut has no license law and all boats are allowed to take oysters at any time upon the public beds; or at least this was the case in January, 1883, the date of the last report of the State commissioners, although in this report the commissioners recommend that each vessel or boat or steamer which is used in cultivating, gathering, planting or transporting oysters, either on the natural beds or on private grounds, shall be licensed and shall display a license number while so used. The object of this measure is not revenue to the State, but the protection of the private beds, and the license fee is only one dollar for each boat, and the license does not require annual renewal, but is good indefinitely. The system of licenses and numbers is simply to prevent theft, and it is stated that such a law would render thieving almost impossible, since vessels working without numbers, or vessels with numbers working upon the grounds of other persons could be detected at a distance.

None of the oysters which are taken in the natural beds of Connecticut are sold as food, as they are all small and only fit for planting. They are sold to the holders of private planting grounds, and are almost exclusively planted in the State.

THE PRIVATE OYSTER GROUNDS OF THE STATE OF CONNECTICUT WITHIN THE AREA WHICH IS UNDER LOCAL MANAGEMENT.

The natural beds of the area which is governed by the bordering towns, are, like those in deep water, public property, and they cannot be appropriated for private oyster cultivation, but each town has power to appoint a committee of five electors, who may designate any other grounds for this purpose.

Application must be made to them in writing, and no person can appropriate more than two acres. The lands which are thus appropriated are taxed like real estate. And they may be attached or executed upon like real estate. The oyster committee of each town has power to decide upon the sum which is to be paid for the grounds, and the term of years for which they are to be leased. No person can gather any oysters upon private grounds unless they are properly staked or buoyed out, and marked at each corner with the owners name.

The removal of oysters from private grounds without authority from the owner, is punished by a fine of from $300 to $500, or by imprisonment for one year; and the injury or destruction of the stakes or buoys, or the grounds, or the oysters upon them, is punished by a fine of from $7.00 to $50, or by imprisonment from one month to six months, and any boats which are used in violation of these laws are sold at auction, the captor receiving one-half the proceeds, and the town the other half.

Certain towns, however, have a somewhat different law; thus the town of Guilford has, by special act of legislature, the right to lease its grounds for ten years, to the highest bidder at public aution, but it cannot lease more than five acres to one person.

The grounds which are thus appropriated to private parties by the towns, are not used for farming or propagating oysters except in a few casess, but simply for planting, and the seed is either taken from the public beds or is purchased from the holders of private grounds in the area under the jurisdiction of the State, or from persons outside the State.

The system does not therefore materially increase the number of oysters, but it does greatly increase their value, and it is therefore a great source of wealth to the people of the State, and nearly all lands adapted for the purpose are now appropriated.

OYSTER CULTIVATION IN THE DEEP WATERS OF CONNECTICUT, ON GROUNDS OVER WHICH THE STATE HAS EXCLUSIVE JURISDICTION.

The business of planting oysters in Connecticut under the provisions which have just been explained grew so rapidly that all the available inshore bottom near New Haven was soon occupied,

and these waters looked like a submerged forest, so thickly were they planted with boundary stakes, and at last Mr. H. C. Rowe ventured out into the deeper water of Long Island Sound and inaugurated a new era in American oyster culture by the establishment of an oyster farm in water forty feet deep.

This new departure has led to the development of a new form of oyster culture which is not planting, but farming in its true sense, since the "seed" oysters are seeds in reality, bringing forth after their kind a thousand fold, and thus building up, on private grounds, what can be most briefly described as artificial *natural* beds of oysters.

The movement which has led to this result is the most important step which has ever been taken in America towards an enlightened method of managing the oyster industry.

It has been met at each stage by the most violent opposition, and its history should be of the very greatest interest to all States which control waters in which oysters flourish.

Mr. Rowe soon had many imitators, and as oyster culture in deep water cannot be managed on a small scale the tracts which were appropriated were necessarily outside the limit of two acres, which was all that was allowed by a strict interpretation of the law.

The rapid development of the industry was watched with angry excitement, and as it was soon seen that the existing statutes had never contemplated anything of this sort, alterations and amendments rapidly followed one another, now in the interest of the deep-water cultivators, and now in the interest of the owners of the small planting tracts nearer the shore.

The fishermen along shore indignantly opposed the capitalists, and on the ground that everything under the water is common property, openly removed the oysters from private grounds.

As there was no survey or exact delineation of the "natural beds," unlimited stealing from private grounds was perpetrated and looked upon with general favor by the great majority of the fishermen, on the plea the grounds in question were "natural beds."

The deep-water cultivators, increasing in numbers and in influence, were able, in 1875, to secure the passage of a law declaring that in a considerable area of the State there are no legally "natural beds," and the possibility of successfully propagating oysters in great numbers, in deep water, was soon proven, and the business continued to grow and to increase in importance, in spite of opposition, but so much discontent existed that the following resolution was passed by the Legislature of 1879:

"Whereas, the raising of oysters from the spawn in the deep waters of this State, in Long Island Sound, has proven by experience to be a success;

"Whereas, there is an immense tract of available oyster-ground between the town boundaries and the southerly boundaries of the State, which cannot at present be used, because the State has granted no authority to designate it;

"Whereas, these grounds can be disposed of so as to bring a large sum into the Treasury of the State; therefore,

"*Resolved by the Assembly*, That a commission, consisting of three person, be appointed by the Governor to prepare a plan, and report to the next session of the General Assembly, for the gradual disposal of the grounds in the waters of this State which are suitable for the cultivation of oysters. Said commission shall examine all existing statutes relating to oyster-grounds and town lines in sound, all customs and by-laws in different parts of the State, and such other matters as pertain to oyster-fisheries, so that the system devised shall be of general application, and enable the State to dispose of the franchise of the grounds to the best advantage," and in accordance with this resolution acts were passed by the Legislature in 1881 and 1882 to provide for the needs of the new industry and place it upon a secure and permanent basis.

The first step was the establishment of a line to separate the deep water fisheries from those along shore, which remain under the management of the towns, while the State has assumed exclusive

jurisdiction and control over all the fisheries outside the line, and has appointed a board of three paid oyster commissioners to oversee and govern this area.

The most important duties of these commissioners are the sale of grounds for oyster cultivation and the assessment and collection of the State tax upon these grounds.

The manner of selling grounds is as follows: Any person who has been a resident of the State for one year, or any company of such persons, may make application, in writing, to the commissioners for the right to cultivate oysters upon any part of the deep water area which is not a natural bed. The form of this application is prescribed by law, and it is given in full on page——of this report. Upon receipt of such an application the commissioners are required to post for twenty days in the town-hall of the adjoining town the notice which is copied on page——of this report in order to give all interested persons an opportunity to file objections, and if no objections are made, or if those which are made are not sustained in a hearing before the commissioners, they are required, after the land in question has been surveyed and mapped, and after the applicant has paid them one dollar for each acre, to issue to him a lease in the form given on page——of this report, which shall describe the grounds and shall state that he has purchased from the State the right to all the oysters upon them forever, provided they are not natural beds, and provided he shall at once cause them to be staked or buoyed, and provided he shall occupy them for the purpose of cultivating oysters within five years. The lands may be attached and executed upon like real estate, and the owner may sell them to any resident of the State. He owns all the oysters upon them, and may take them by steamboat or in any way or at any time that he chooses, but the commissioners recommended in January, 1883, that a law be passed requiring every boat so used to be licensed and to exhibit a license number. The fee for the license is to be one dollar, and it is good indefinitely, as the object of the law is not to raise revenue, but to protect the beds from unauthorized boats and to give a ready means of identifying each boat at a distance. (Lack of space has compelled us to omit, at the last moment, the documents which are here referred to.)

There is no limitation of the quantity of ground which a person may own, but an annual State tax of one per cent. is imposed upon all grounds appropriated for oyster culture in the deep water area. Each owner of ground is required to deliver annually to the commissioners a sworn statement of the number of acres he owns and of their value, and if he fails to do so the commissioners are required to make up a statement from such information as they can get, and to add to this ten per cent. The tax of one per cent. is laid upon this valuation, and is collected by the commissioners for the State; and they may, after the legal limit of time has expired, seize and sell any property of the owner, which is not exempt from execution, in payment of the tax.

Theft of oysters from the private grounds, or injury to the grounds or oysters, is punished by stringent laws, which are given in full further on.

Some of the grounds which are appropriated for oyster culture are used simply as planting grounds for small seed oysters, but most of them are true farms where fresh seed is raised each year. There are three methods of cultivation: 1st. The bottom is first cleared and is then covered with seed oysters, just as they come from the natural beds, unculled, and mixed with shells, gravel, and so forth; or 2d. The bottom is covered just before the spawning season with clean oyster shells, and twenty-five bushels of brood oysters are distributed over each acre to supply seed; or 3d. If the grounds are near a natural bed they are simply shelled and are left to catch the drifting spawn which is brought to them by the tides and currents. The shells do not "catch a set" every year, and in case of failure it is necessary to rake over the shells or to cover them with fresh shells just before the next spawning season. Where a set is secured an enormous crop is the result, and the commissioners state that the dredge was drawn at random in their presence in a private deep water bed, and from an ordinary-sized shovelfull of shells there were counted 206 young oysters in excellent condition, of the

average size of a quarter of a dollar. As many as 100 young oysters have been counted growing on a medium-sized shell.

The progress of the industry has been most satisfactory, and in 1882 $14,928.33 was paid to the State for ground, and the commissioners state in their annual report, January, 1883, that

"There are now pending one hundred and fifty applications, covering an aggregate area of 23,162 acres, all of which it is expected, will be surveyed and deeded in time for the next shelling season. Each application, so far as practicable, will be attended to in the order of its date."

"The foregoing table affords the ground for the assumption that by the time of the opening of spring work, in 1883, forty-five thousand (45,000) acres of ground will have been deeded to applicants by the commissioners. These, with the forty-five thousand (45,000) acres deeded by the towns prior to May, 1881, will show an aggregate of ninety thousand (90,000) acres held by cultivators under State jurisdiction."

"Of this vast area a large portion has been cleared up and shelled. One firm has laid down 250,000 bushels of shells. Several large growers have laid down as many as 200,000 bushels each. A still larger number have scattered 100,000, 50,000 and 20,000 each. There are about 30 steamers engaged in the business, besides a very large number of sailing vessels. Shells that but a few years ago were almost worthless have increased in value, and are sought after far and near. It is estimated by competent judges that the number of acres under cultivation is at least double what it was one year ago. With trifling exceptions good sets have been secured upon the beds, and if no unusual accidents occur, the crop, the next two years, will be enormous. One cultivator alone looks for no less than 1,000,000 bushels of marketable natives from his own grounds. Several other growers, individuals and companies are looking for like large crops, and all are planning to still further extend their farms."

The new law has been in force for less than three years, yet a writer in the New Haven Palladium this summer gives the following brief but significant statement of the result:

"Fifty thousand acres of entirely barren ground, covered 30, 40 and 50 feet deep by the waters of Long Island Sound, have been made into productive oyster beds, and have multiplied by a hundred fold the production of the native oysters. Ten years ago tens of thousands of bushels of oysters were imported from New York, New Jersey and Rhode Island, and now hundreds of thousands of bushels are yearly exported to these States and to Massachusetts. Millions of dollars are now invested in the industry, thousands of men and women are employed, millions of bushels are in growing crops, and hundreds of thousands of dollars yearly come into the State as proceeds of exported oysters. The oyster cultivators have paid more than $50,000 to the towns and to the State for ground to cultivate, and pay a yearly tax to a large amount."

The following account of the method of laying out and stocking a deep-water oyster farm in Connecticut, and the statement of the attendent expenses, is copied from Ingersoll's "Report on the Oyster Industry of the United State:"

"The process by which a man secures a large quantity of land outside has been described. It is thought hardly worth trying unless at least 50 acres are obtained, and many of the oyster farmers have more than 100 acres. These large tracts, however, are not always in one piece, though the effort is to get as much together as possible. He obtains the position of his ground, as near as he can, by ranges on the neighboring shores, as described in his leases, and places buoys to mark his boundaries. Then he places other buoys within, so as to divide his property up into squares, an acre or so in size. In this way he knows where he is as he proceeds in his labors. Having done this, he is ready to begin his active preparations to found an oyster colony."

"The bottom of the sound opposite New Haven, as I have said, is much of it smooth, hard sand, with occasional little patches of mud, but with few rocks. The depth varies from 25 to 40 feet. This

area is almost totally void of life, and no oysters whatever were ever found there, except after some 'dumps' were made outside the light-house, by the dredging boats which had been cleaning out the channel and deposited many living oysters along with the other dredgings in the offing. These dumps very soon became, in this way, oyster-beds, supplying a considerable quantity of seed, which was public property, to be had for the dredging, and taking their share in the incessant controversies as bones of contention."

Preparation of a deep-water oyster-farm.—"When a cultivator begins the preparation of a deep-water farm, his first act is to scatter over it, in the spring (about May,) a quantity of full-sized, healthy, native oysters, which he calls 'spawners.' The amount of these that he scatters depends on his circumstances; from 30 to 50 bushels to the acre is considered a fair allowance here, I believe. The rule is, 1 bushel of spawners to 10 bushels of cultch. He now waits until early in July (from the 5th to the 15th is considered the most favorable time,) when he thinks his spawners must be ready to emit their spat. He then employs all his sloops, and hires extra vessels and men, to take down to the harbor the tons of shells he has been saving up all winter, and distribute them broadcast over the whole tract of land he proposes to improve that year. These shells are clean, and fall right alongside of the mother-oysters previously deposited. The chances are fair for catching of spawn. Sometimes the same plan is pursued with seed that has grown sparingly upon a piece of ground; or young oysters are scattered as spawners, and the owner waits until the next season before he shells the tract. Sometimes there must be a preparation of the ground, before any operations can be begun upon it, by elaborate dredging or otherwise. Within the harbor, for instance, considerable muddy bottom has been utilized by first paving it with coarse beach-sand. No spot where there is not a swift current, is considered worth this trouble. The proper amount is 200 tons of sand to the acre, which can be spread at the rate of five-sharpie-loads a day, at no great expense. The sand forms a crust upon the mud firm enough to keep the oyster from sinking, and it need not be renewed more than once in five years."

"*Expense of an Oyster Farm.*—In either case, therefore, the planter's expense has not been enormous. I present herewith two statements of the outlay under the operations outlined above, which are as follows:

No. 1.—Fifty Acres.

2,000 bushels spawners, at 30 cents	$ 600 00
15,000 bushels shells, at 3 cents	450 00
Planting 15,000 bushels shells, at 4 cents	600 00
	$1,650 00

No. 2.—Sixty Acres.

2,000 bushels of spawners, at 56½ cents	1,130 00
17,000 bushels of shells, at 4 cents	680 00
4,453 bushels Bridgeport seed, at 10 cents	445 30
	$2,255 30

"In a third case, Capt. George H. Townsend gave me a statement of the expenses of starting a farm of 25 acres, off the mouth of East Haven River. This was a more elaborate arrangement, but on the other hand was accomplished, through a variety of favorable conditions, cheaper than would have been possible with ground otherwise situated:

2,000 bushels small river oysters, at 25 cents	$ 500 00
Spreading same and Staking, at 5 cents	100 00
600 bushels dredged seed, at 40 cents	240 00
10,000 bushels of shells, put down at 4 cents	400 00
	$1,240 00

"I think it would not be unfair to average the cost of securing, surveying and preparing the deep-water beds at about $40 an acre, or about $4,000 for 100 acres. To this must be added about $2 an acre for ground surveys, buoys, anchors, etc. But now that he has got his set everywhere upon this 50 acres of shells, the planter's anxieties have just begun. The infant mollusk, when first it takes hold upon the stool, the merest speck upon the surface of the white shell, is exceedingly tender. The chances in its favor in the race against its numberless adversaries are extremely few, almost as few as befriended the egg when first it left the protection of the mother-mantle. The longer it lives the better are its chances, but the tender age lasts all through the autumn and until it has attained the size of a quarter-dollar piece. After that it will withstand ordinary discouragements. It often happens, therefore, that the 'splendid set' proves a delusion, and Christmas sees the boasted bed a barren waste. The cultivator finds his work as risky as mining. 'You can't see into the water,' he says; and the miner quotes back his proverb, 'You can't see into the ground.' A sufficient cause may usually be assigned for the death of large districts of infant oysters which appeared to get a good start. Starvation is probably the true explanation. Some evil current bore away from them the necessary food. In other cases specific causes, the most potent of which are storms, can be pointed out."

" *Vicissitudes and Losses of Oyster-Planting.*—In the fall just when the young oyster-beds are in their most delicate condition, occur the most destructive gales that afflict the Connecticut cost. They blow from the southwest, and if, as occasionally happens, they follow a stiff southeaster, producing a eaoss-sea of the worst character. The water is thrown into a turmoil to a depth, in some cases, of four or five fathoms, and everywhere between that and the beach the oyster-beds are torn to pieces, all boundaries are dissolved, and windrows of oysters containing thousands of bushels, are cast up along the whole extent of the beach. Although so great a disaster as this is rare, it does occasionally happen, and hardly a winter passes without more or less shifting of beds or other damage by tempest. The burying of beds under drifted sand is more uncommon off New Haven than easterly; but in the harbor, where the bottom is soft, mud is often carried upon the beds to such an extent as to smother, if not wholly to hide, the oyster. All that part of the harbor near the mouth of West River is so liable to this accident that oystermen have abandoned that district altogether. It is believed by many that the beds in the sound, in water more than twenty-five feet deep, are safe from disturbance from gales; but others decline to put their faith in any depth thus far planted. Frequently oysters cast up by storms, if attended to immediately, can be saved and replanted with profit.

"*Management of the Oyster-Farm.*—Having secured a colony of young oysters upon the stools which have been laid down for them, they are left alone until they attain the age of three, four or five years, according to their thrift and the trade for which they are designated, by the end of which time they have reached a large size and degree of fatness, if the season has been favorable. If, as is largely done by those planters who live at Oyster Point, the oysters are to be sold as seed to Providence River or other planters, they are taken up when only one or two years' old. Not a great quantity of this seed was so disposed of last year—not over 20,000 bushels, I should say. It is not considered, as a rule, so profitable as to wait for the maturity of the stock."

Section IV.—The Oyster Industry and Oyster Laws of New York.

In early days the waters of the vicinity of the city of New York abounded in oysters, and most of the early writers speak of their fine flavor and great size and abundance. As early as 1715 the colonists began to be alarmed by the diminution of the supply and it was found necessary to pass the following law: "From and after the publication of this act it shall not be lawful for any person or persons

whatever, native free Indians only excepted, from and after the first day of May until the first day of September, annually, to gather, rake, take up or bring to the market any oysters whatever, under the penalty of twenty shillings for every offense, to be recovered before any of His Majesty's Justices of the peace, who are hereby authorized and required to hear and finally determine the same, one-half thereof to turn to him or them that shall bring the same to effect and the other half to the poor of the place where the offense shall have been committed. And it shall not be lawful for any negro, Indian or mulatto slave to sell any oysters in the city of New York at any time whatsoever, under the penalty of twenty shillings for every offense, to be paid by the master or mistress of such slave or slaves, to be recovered and applied as aforesaid." Ingersoll says this is the first oyster law which was passed in this country.

Many of the natural beds in these waters have been entirely exterminated, but notwithstanding the great drain upon them which has followed the growth of the city of New York, many of the beds in East River and upon the south shore of Coney Island are still in a prosperous condition, and continue to yield fine oysters for food as well as a valuable supply of seed oysters for planting. The preservation of these beds is no doubt due in part to the prohibition of dredging, but chiefly to the fact that for the last fifty years their fertility has been increased by the practice of shelling them just before the spawning season, and thus securing the attachment and growth of a great number of young which would be lost without this artificial aid.

The methods of oyster farming which are employed by the cultivators of New York are fully described in our chapter on oyster farming, and it is only necessary to say here that these efforts have resulted in the preservation of beds which, owing to their proximity to the great centre of commerce and population, have been very heavily taxed by the demands which have been made upon them.

LAWS OF NEW YORK.

No person who has not been a resident of the State for six months can take oysters within the State, unless such non-resident is employed by a resident.

No dredge operated by steam, or weighing more than thirty pounds, can be used.

No natural bed can be used for planting or can be staked off for private use.

No non-resident can plant oysters in the waters surrounding Staten Island without the consent of the owner, and no non-resident can take oysters from the natural beds in the same waters.

No person is allowed to dredge on the natural beds in the vicinity of Staten Island.

Any owner of land adjoining Harlem River may plant oysters in front of his property where the ground is not occupied, and no person can take oysters from such ground without his permission, under a penalty of $50.

The penalty for catching or dredging oysters on private grounds in East River is a fine of not more than $250, or imprisonment for six months, or both.

In Queen's county, any resident may plant oysters in any public waters where there are no natural beds, but no person can hold more than three acres, nor can he hold it unless he uses it for planting.

No person is allowed to take oysters in Great South Bay, Long Island, with a dredge, or in the night, or between June 15 and September 15, under a penalty of a fine of $250, imprisonment for six months, and an additional fine of $600 for each offense; half the penalty goes to the informer.

In Suffolk county any five or more persons who hold oyster lots may form a company or corporation for the promotion of oyster culture in these lots.

The towns of Babylon and Islip, in Suffolk county, have a special law, which is substantially as follows:

"Any person who is of age, and who has been an inhabitant of the county for a year, may appropriate four acres, 'where the taking of clams cannot be profitably followed as a business,' and upon the payment of $1 per acre annual rent and the costs of surveying he has the exclusive use of the land for the cultivation of oysters so long as he keeps it marked out and remains an inhabitant of the county, but he is required to pay his annual rent on or before the first day of April, and to plant at least 100 bushels of oysters and shells on the ground within one year of the date of his certificate, and in case of failure the Oyster Commissioners have the power to terminate the lease."

"Any person may sell and assign his interest in private oyster ground to any inhabitant of the county for one year, but no person can at one time hold more than four acres."

There are three commissioners appointed by the town auditors, with power to determine what grounds shall be appropriated, to make surveys and maps, to settle disputes regarding boundaries, and to receive money.

The unlawful taking or disturbance of oysters on private grounds is punished by a fine of not less than $100, or by imprisonment for not more than 60 days, or both.

There is no oyster police, but the planters have formed a protective association and employ private watchmen.

Any inhabitant of the towns of Hempstead and Jamaica, in Queen's county, may appropriate three acres of any lands which are not already appropriated for the cultivation of oysters, and upon the payment of an annual rent of $5 per acre he has the right to use the land for this purpose so long as he remains an inhabitant of the towns. No dredging is allowed in these waters under a penalty of $100 fine, or sixty days imprisonment, or both, and the taking or disturbance of oysters in private beds is punished by $100 fine, to be recovered by the owner.

Section V.—The Oyster Industry and Oyster Laws of New Jersey, Condensed from Ingersoll's "Report on the Oyster Industry of the United States."

In certain counties the closed season is from May 1 to September 1; in others, from July 1 to September 1, and in others, from May 1 to October 1, and there is a fine of $10 for each offense; but a holder of a private bed may take oysters at any time. In Cumberland county the taking of oysters on Sunday or in the night is punished by a fine of not more than $500, and by imprisonment. There is a penalty of $5 for offering oysters for sale, except from private beds, during the closed season.

Residents are allowed to dredge in certain parts of Delaware Bay, but no boat is permitted even to carry a dredge in any other waters, under a penalty of $50 fine.

There is a penalty of $50 for gathering oysters to be made into lime or used in the manufacture of iron.

No one except a six-months' resident of the State is allowed to take oysters for himself or his employer, under a penalty of $150 fine or imprisonment, and the forfeiture of the boat and all apparatus used.

Any person may enclose any creeks, ditches or ponds which lie within the bounds of his own land above any public landing, for oyster culture, whether there are natural oysters in them or not, and trespass upon such grounds or injury to the enclosure is punishable by a fine of $100 or imprisonment for six months, or both; but free navigation cannot be obstructed by oyster enclosures.

"No person shall take away from any natural oyster bank or bed, which is not private property, any old oyster shells which can be separated from the oysters without injuring them, and all such shells must be culled and thrown back upon the natural beds, under a penalty of $10 fine and the forfeiture of the boat and apparatus."

The oyster beds of the sea-coast of New Jersey are governed by the general laws which have just been given, together with a few local laws, and no dredging is allowed, while the fisheries upon Delaware Bay have another set of laws, which will be noticed soon.

The oyster industry of the sea-coast consists in part of fishing upon the public natural beds, and in part of oyster farming and oyster planting.

The natural beds along the coast are numerous and valuable, and they formerly abounded in large, fine oysters, but for many years they have furnished scarcely any oysters large enough for food, and they are valuable only as a supply of young seed, for planting, and as most of the shells have been removed from these beds, together with the oysters, their value even as a seed supply has been greatly impaired.

Experiments have shown that it is easy to greatly increase the yield of the public natural beds of New Jersey, by shelling them, but as public sentiment is averse to any private enterprise in this direction, the young oysters are usually stolen as soon as they are large enough to handle; but in Great Egg Harbor River several men have, within a few years, undertaken to raise young oysters by planting shells, and thus catching the floating young, and they have no difficulty in thus catching every year an abundant supply of young oysters, which they sell to the planters.

The planting industry of the sea-coast supports about nine hundred families, and about 77,500 bushels of Chesapeake Bay oysters and 250,000 bushels of native seed are annually planted, the latter chiefly from the natural beds of the State. The value of the planted oyster to the planters is about $310,000 a year.

The planting industry is regulated by the State laws, which have already been referred to, and by local laws, among which are the following:

In 1870 a law was passed allowing the board of freeholders of Monmouth county to occupy for twenty years the grounds in Shark river, and to appoint commissioners to survey these grounds and divide them into two-acre lots, to be rented to citizens at public auction for from one to five years, with power to renew for ten years more. The commissioners have power to enforce the laws and collect rents and fines, which are paid to the credit of the school fund.

In 1877 two hundred lots were leased under this law at an average rental of two dollars a year.

In Barnegat bay oyster planting has been in existence for more than fifty years, and the law allows any citizen of the State and resident of the county to stake off two acres within three hundred yards of the shore for the cultivation of oysters, whether oysters naturally grew there or not, and to have the exclusive right to the ground. The penalties for the violation of this right are adequate, but public sentiment is opposed to the execution of the law, and no man is willing to risk his money in planting. The industry was formerly very prosperous, but while there are hundreds of acres of good bottom lying idle and plenty of capital ready to be employed, the business has dwindled away and is now of little importance.

THE OYSTER FISHERIES OF THE STATE OF NEW JERSEY IN DELAWARE BAY.

The whole eastern shore of Delaware Bay abounds in natural oyster beds, which formerly yielded large, fine oysters, but few of them now furnish oysters large enough for market, although they yield annually, according to Ingersoll's report, about 2,400,000 bushels of seed, which is planted upon about 6,000 acres of private ground, and is ultimately sold by the planters for about $1,600,000. About 1,600 families are supported by the business, which is managed under the following law, passed in 1856:

SECTION 1. Authorizes the board of chosen freeholders of Cumberland county to occupy for twenty years, for the use hereinafter stated, Maurice River Cove within the following boundaries: "Beginning at low-water mark, directly opposite East Point, in the township of Maurice River, Cumberland county, and running thence a south course to the main ship channel; thence by a straight line to low-water mark directly opposite to Egg Island Point, in the township of Downe, in said county, and thence by low-water mark the several courses and distances of the shore bordering on the said cove, and covering the mouths of the several streams that empty into said cove, to the place of beginning." But the "natural oyster beds in Maurice

River Cove or Delaware Bay, known severally as the East Point beds, Andrews' Ditch beds, the Pepper beds, the Ballast beds, and the beds that fall bare at low tide, shall not be occupied for planting oysters, nor dredged upon, nor shall oysters be taken from the said beds, nor from any of the rivers or creeks of Cumberland county, for the purpose of planting (but all citizens of this State shall have free access to them to catch oysters for their own use)," under heavy penalties for violation.

SEC. 2. Authorizes the board of chosen freeholders of Cumberland county to appoint one or more persons, holding office for one year, to stake off the said cove and make a survey and map of the shores and land covered with water, a copy of which shall be filed in the county clerk's office, and "lay off and caused to be marked by stakes such subdivisions of said cove, not exceeding ten acres each, as in their discretion shall seem best designed to promote the planting and growth of oysters; *provided* the navigation of said cove be in nowise obstructed thereby; *provided*, that no person shall own more than ten acres and no company more than thirty acres."

SEC. 3. And it shall be lawful for the said commissioners, after subdividing the said cove, as aforesaid, to lease the same at public vendue to the highest bidders, for not less than one nor more than five years; the bidders shall in all cases be citizens of the State, and shall pay the sum bid annually during the term of the lease. Upon the payment or securing the payment of the annual rent, the bidder shall be entitled to the exclusive use of the designated land for the purpose of planting oysters during the term specified in the lease.

SEC. 4. Makes the penalty for trespassing upon or removing oysters from the leased oyster lots, without written permission of the owner, liability to treble damages; for second offence fine not exceeding $100, imprisonment for 60 days or both.

SEC. 5. Enjoins upon the commissioners the enforcing of penalties and forfeitures against non-resident offenders and the collection of rents due; after paying needful expenses and receiving compensation awarded by the board of chosen freeholders, the residue of money collected shall be applied to the public school fund.

SEC. 6. The commissioners shall make an annual report, under oath, of their proceedings and money transactions.

SEC. 7. Excepts all natural beds from the operations of this law, which took effect April 1, 1857.

SUPPLEMENTS.

SEC. 8. Every boat or vessel lawfully catching, planting and growing oysters on the flats and grounds of Delaware Bay and Maurice River Cove, adjoining the counties of Cumberland and Cape May, shall be assessed annually $5 upon all boats and vessels not exceeding five tons, and $1 per ton, custom-house measurement, upon all boats and vessels exceeding ten tons. This assessment to be paid by the master of the vessel to the collector of the oyster fund between March 1 and May 1 of each year.

SEC. 10. Provides that the said special officer shall occupy an office at Port Norris, where complaints of the violation of the oyster laws may be made. This officer may "arrest any person or persons found stealing oysters in Maurice River Cove or Delaware Bay, or from the banks in Maurice River, or in any of the rivers or creeks of Cumberland county; and any person or persons convicted of such offence shall, for every bushel of oysters found in his or their possession, pay the sum of $1.50, and shall also, for every such offence, forfeit and pay the sum of $100. It shall be the duty of all citizens, when called upon, to aid the special officer in making seizures or arrests, and any citizen, or captain or commander of sail or steam vessel who refuses said aid shall pay $50 fine.

SEC. 11. Appoints a collector of the oyster fund of Maurice River Cove, who shall assess and collect all dues from vessels; shall issue certified licenses, holding force for one year, to all captains of boats and vessels who shall pay the taxes heretofore required, permitting them to engage in catching or planting oysters; shall refuse licenses to all boats or vessels not complying with the conditions of this act; shall pay the salary and expenses incurred by the special officer; and shall himself receive for this service 5 per centum of all moneys he collects.

SEC. 12. The collector shall keep true records of his transactions, record all licenses, etc., and furnish bonds in $2,000 for the faithful performance of these duties.

SEC. 13. Every captain, upon taking out the beforementioned license, shall take oath that he will at all times diligently aid in the enforcement of the laws of New Jersey for the preservation of clams and oysters, and will promptly report to the special officer any knowledge of any violation of said laws; and any captain refusing to take out said license and make said oath, shall forfeit his right to catch or plant oysters in Delaware Bay or Maurice River Cove, and if found doing so shall incur the penalties of a trespasser as heretofore prescribed.

SEC. 14. The proceeds of all property seized and sold shall be paid to the collector for the benefit of the oyster fund. (As a rule, one-half of all fines are similarly appropriated.)

SEC. 15. All persons growing oysters in Maurice River Cove are authorized to meet annually on the first Tuesday of March at Fort Norris, and, having organized into a meeting, they may elect by ballot a special officer and a collector, to serve for one year ensuing, at a salary which may then be fixed; and shall elect an auditing committee of five members, whose duty it shall be to examine and audit the accounts and vouchers of the collector of the oyster fund, and report upon them at each annual meeting. This meeting is also authorized by the consent of two-thirds of those present and entitled to vote, to raise a tax of $1 per ton per annum upon all boats of over five tons measurement, in addition to the tax heretofore imposed by this act; said additional tax to be imposed for one year only at a time, and not to be continued except by consent of two-thirds of the voters at a subsequent meeting.

SEC. 16. Whenever, at the end of a fiscal year, the oyster fund, after expenses are paid, shall exceed $2,000, the collector shall pay the same to the State treasurer, to be applied to the support of the schools of the State.

SEC. 17. Forbids catching oysters "in Maurice River Cove or on any planting ground in Delaware Bay," between sunset and sunrise, under penalty of $50.

SEC. 18. Enacts that every boat or vessel lawfully catching or planting oysters in Delaware Bay, to which a license is given, (as heretofore,) "shall wear in the middle of the mainsail * * * a number painted in black, 18 inches long, and to be designated by the license."

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SEC. 20. Makes it lawful for any person who has been a resident of the State for six months to make written application to the clerk of the Court of Common Pleas of the county in this State, where the applicant resides, for a certificate setting forth that the applicant is a resident (as above), is not engaged in planting oysters or clams, but desires to rake shell-fish within the waters of this State from the natural beds in Delaware Bay, and designating the boat which he intends to make use of.

SEC. 21. The clerk aforesaid having satisfied himself of the truth of the applicant's statement shall thereupon issue to him a certificate stating the facts above.

SEC. 22. Upon presentation of this certificate to the oyster-fund Collector of Cumberland county, it shall be the duty of that officer to issue to the applicant, without charge, except for fees, a license to gather clams, oysters and shell-fish upon the natural beds in Maurice River Cove and Delaware Bay, on board the boat named in the license.

SEC. 23. Stipulates small fees.

SEC. 24. Nothing herein shall affect the force of section 1 of the act of 1846.

The Oystermen's Association—Special Licenses.—Under this law an association of oystermen was formed, and is still in existence. Each year the board of twelve directors fixes the rate of taxation upon the vessels in the association which is deemed needful to cover the expenses of the association. The chief outlay and main object of the association and fund is the providing of a watch-boat and police crew, which shall watch the beds in the cove against thieves, and arrest all boats that do not show, by a number in the middle of the mainsail, that they have a license. Last year (1879), from 227 boats licensed, about $2,000 was collected by Mr. Benjamin Campbell, collector at Port Norris. This year (1880) the fee is 50 cents per ton, custom-house measurement, and the total fee will amount to more than before, since 225 boats are already licensed.

"As usual, where the oyster business has become of great dimensions, and planting is carried on on a large scale, there are a number of persons who are, to a greater or less extent, deprived of real or imaginary benefits and privileges which they enjoyed under a more primitive condition of things. From the enclosed river and ponds, and also from the outside waters of the bay southward of Egg Island, large numbers of large-sized and sweet oysters have always been taken and sent to market or peddled through the neighborhood. When planting beds were so greatly increased in Maurice River Cove, the shore people found that the diligent search for young oysters through marshes, and the persistent dredging during three-fourths of the year, were sensibly diminishing the supply of marketable oysters attainable by the small open boats. Of these there are fifty or more owned along shore. They are too small to come under the association's tax; do not belong to planters, but are owned by men who live near the shore, and gain a large part of their livelihood by tonging and hand-dredging. These people, owing to misfortune or improvidence, are too poor to plant; but can do well if they are allowed to catch all the year round in the southern part of the bay, where all oysters taken are of marketable size. For the protection of this class, therefore, against any possible rapacity of more fortunate and powerful neighbors, the Legislature this year passed a law which gives general satisfaction. This makes it unlawful 'to catch oysters from any of the natural beds in Delaware Bay, north of a line bearing southwest from the mouth of Sow and Pigs Creek, in the county of Cumberland, from the last day of June in each year to the first day of April in the succeeding year, and no oysters shall be caught south of said line for the purpose of planting at any season of the year; and any person offending against either of the provisions of this section shall be deemed guilty of a misdemeanor.' Punishments are a fine of $100, or imprisonment, with forfeiture of the craft and its furniture."

Section VI.—The Oyster Industry and Oyster Laws of Delaware, Condensed from Ingersoll's Report on the Oyster Industry of the United States.

The natural beds of this State are small and unimportant, covering less than 500 acres in all, but the planting industry is well developed, occupying 3,000 acres, employing 625 men, paying $117,000 wages, and returning to the planters about $800,000, of which nearly $500,000 is profit.

The natural beds furnish a very small part of the seed which is used for planting, most of which comes from the Chesapeake Bay.

Of the 1,000,000 bushels of seed which is planted annually—

488,880	bushels	are	from	Maryland.
215,820	"	"	"	Virginia.
210,000	"	"	"	Delaware.
160,000	"	"	"	New Jersey.
1,074,700				

As the Chesapeake Bay oysters are said to cost the Delaware planters only about 25 cents per bushel, the returns to the people of Maryland, for oysters, which yield nearly $250,000 of the profit to the citizens of Delaware, must be very small indeed; in fact, as most of them are captured by boats which come through the canal into our waters for the purpose, the only benefit to our people is the State license fee, when this is collected. The licensed boats must of course be owned by citizens of Maryland; but even in this case the sale for 25 cents of oysters, which are resold for 80 cents, is a great loss to the State, since a system of oyster planting in our own waters would save us this added value.

One of the most interesting features of the planting business in Delaware, is the fact that after a planting ground has been stocked year after year in this way, for ten or fifteen years, even upon muddy bottom, the accumulation of shells gradually hardens the bottom, and furnishing a suitable surface for the attachment of spat, often converts a mere planting ground into a true oyster farm or artificial "natural" bed. In such a case the law-abiding citizens of Delaware do not dispute the right of the owner, and the ground thus becomes extremely valuable and self-supporting. It is probable that the same results might be reached much more quickly by shelling the bottom thoroughly at the spawning season.

Laws of Delaware.

Section 1. Forbids any person not a citizen of the State to take oysters, or clams, or terrapins in the waters of the bay without having a license, which license shall be granted at a cost of $50 by a county clerk of the peace, and shall be good for one year for the boat named. Violation of this section shall be a misdemeanor, fined $50, and the boat and tackle shall be detained for trial before any justice of the peace. Powers are given to sheriffs to seize, and penalties for resistance of process are decreed at length.

Sec. 2. Makes it unlawful for any person not a citizen of the State to take oysters, clams, or terrapins from any "river, creek, or pond within this State, and put them on board of any boat or vessel not wholly belonging to and owned by citizens of this State." Penalties for violation as in section 1.

Sec. 3. All oysters caught in any such river, creek, or pond (except Misspillion or Murderkill creeks), shall be culled at the place where they are caught, and the young and refuse oysters there deposited.

Sec. 4. Forbids taking away from any river, creek, or pond (except Delaware and Indian Rivers), more than 20 bushels of oysters or clams at one time; and no vessel in any waters of this State shall be loaded from any vessels authorized by this section to carry 20 bushels or less.

Sec. 5. It shall be unlawful for any person to take oysters from any river, creek or pond in this State, between April 30 and September 1, or at any time to be planted anywhere else in or out of the State, or to use a dredge there. Violation incurs fines and confiscation of vehicle and oysters obtained.

Sec. 6. Prohibits selling more than five bushels of oysters from Misspillion creek to be taken out of the State.

Sec. 7. Any citizen of the State may appropiate to his own use not exceeding an acre of bottom for planting oysters, and, having marked the same by stake or other visible boundaries, and planted oysters therein, it shall be unlawful for any other person to take oysters therein growing, under penalty of forfeiting $50 to the owner of such plantation. But no place shall be so appro-

priated where oysters are growing, or so as to impede navigation; nor shall more than 40 feet square of Lewes creek be appropriated by any person.

SEC. 8. Forbids laying out or bedding oysters on the flats, shore or bank of any stream.

SEC. 9. Protects terrapin eggs.

CHAP. 551.

SECTION 1. Every person or company engaged in the business of opening oysters in this State for exportation amounting to more than $500, shall take out a license.

SEC. 2. This license shall be granted by a clerk of the peace for $30, good for one year.

SECS. 3 to 7. Instructions to officers, etc.

LAWS OF 1871—CHAP. 9.

SECTION. 1. All oyster plantations, not exceeding 15 acres, heretofore made in the Delaware Bay, shall be deemed the possession of the respective planters of them, and the oysters thereon shall be their private property, on condition that rent shall be paid as hereinafter provided, beginning May 1, 1871.

SEC. 2. Any person may appropriate not exceeding 15 acres of the free bottom of Delaware Bay, south of Reedy Island and west of Blake's Channel, for planting oysters, which shall be properly designated by stakes. This ground, and the oysters planted thereon, shall be private property. "But before any one shall avail himself of this privilege he shall apply, in writing, to the said collector for a license for that purpose, and pay to said collector the sum of $25 as the fee and price therefor, and also the sum of $3 per ton (custom-house measurement) for the vessel to be employed in the business of planting. The said license shall last only for one year. * * * The privilege granted by this, and the first section, shall not embrace any portion of the bottom which is a natural oyster bed, and has been hitherto used and worked as such, nor shall it be extended beyond the mere right to plant oysters and hold them as property."

SEC. 3. No person not a resident of the State, or a regularly licensed planter, shall dredge or otherwise take oysters from any public oyster bed of this State; penalty, $100 for each day's offence and forfeiture of all boats and tackle. "The fee for license to dredge the public beds shall be $3 per ton (custom-house measurement), * * * but such license shall not be taken to authorize the planting of oysters."

SEC. 4. "The different plantations shall be treated as numbered in the order in which the licenses to plant are issued under this act, and the boat or vessel used * * * shall wear that number painted in black, at least 18 inches long, in the middle of her mainsail." And also "shall wear, in the middle of her mainsail, a Roman letter, painted in black, 18 inches long, to be designated in the license."

SEC. 5. For the purpose of protecting the oyster beds in the bay, and those who plant oysters under this act, the collector of license-fees is instructed to purchase or hire out of the money collected a suitable "watch-boat," manned by a captain and two men. She shall be employed night and day from March 1 to September 1, or longer, and may call upon any other boat's crew to help her as a *posse comitatus* in the enforcement of this act against trespassers. The proceedings to be taken subsequent to arrest, and upon conviction, with disposal of fines, are fully stated.

SECS. 6, 7, 8. Instructions to captain of watch-boat as to powers and duties, and statement of form of proceedings against offenders, and penalties for those who resist the police.

SEC. 9. Forbids *any one* dredging in July or August, or on Sunday, or between sunset and sunrise.

SEC. 10. Taking oysters from another's plantation is designated to be larceny, and punished accordingly.

SEC. 11. Forbids depositing oysters in any streams in this State and taking them up in July or August, except with tongs.

SEC. 12. An oath is required of every person taking out a license, that he will not violate or allow his vessel to be used in violation of this act.

SEC. 13. A license applies to only one vessel, whose name must be stated therein.

SEC. 14. The governor shall furnish suitable licenses in blank to the collector.

SEC. 15. The collector shall be appointed by the governor of the State; he shall take oath of office and give penal surety.

SEC. 16. The duty of the collector shall be to enforce this act; when so engaged the watch-boat shall be under his orders, and he is clothed with all the needful powers.

SEC. 17. Creates a new justice of the peace at Little Creek Landing, Kent county, specially to administer this law.

SEC. 18. Compensation of collector fixed at 5 per cent. of moneys collected, not to exceed $1,000; of captain of watch-boat, $80 per month, and of crew, $40 per month each, they finding their own board, to be paid out of funds collected..

SEC. 19. Moneys collected to be for the use of the State, except what is needed for expenses under the act.

SEC. 20. Publication of the act.

SEC. 21. In case of the use of a boat of only two tons burden, the license shall cost only $25.

LAWS OF 1875.

SECTION 1. Instructs all oyster boats acting under Delaware laws not only to cease their occupation, but to be taken "within the land" at or before sunset, and the captain of the watch-boat must enforce this. A signal for retiring shall be given from the

watch-boat; and when this is shown there shall be an end, until sunrise next day (not Sunday), of all work upon the oyster plantations or upon the public beds. Such signals shall be the lowering of the watch-boat's flag. This flag shall be of navy-blue bunting, six by four feet in length, with a diamond of white in the centre, having a diameter of two feet between the points farthest apart. She shall always wear it at her maintopmast head during the working hours, and she shall never leave the planting grounds, but shall cruise up and down the same, if the wind will allow, except when she is compelled by floating ice, severe stress of weather, accident, or want of repairs or supplies, from remaining in the bay, it being the design of passing this act, as it was of passing prior acts, that honest parties who plant oysters under the shield of the State authorities shall be protected in the rights which were intended or hereby meant to be secured to them; and that offenders against such authority shall be brought to condign punishment.

Secs. 2, 3. Prescribes as penalties for violation of section 1, annulment of license, forfeiture of boat and equipment, and refusal of license for two years succeeding the offence. The exact method of procedure before the court, in executing trial and penalties, is set forth at length.

Sec. 4. Where a plantation license has been issued and a plantation appropriated, and the fee for any year is in arrear, no right to dredge or dispose of said plantation shall exist until all the back fees are paid up, and no sale or disposal of an oyster plantation, or right to dredge it, or plant upon it shall be valid until first approved by the collector, who shall not give his approval if, in his judgment, it will be prejudical to the interests of the State, or of planters whose plantations lie in the neighborhood.

Sec. 5. No boat whatever shall be allowed to work until her owner has complied with the law in regard to wearing her number, of legal dimensions, upon her mainsail; and if she attempts to do so she shall be seized by the collector or captain of the watch-boat and held until her number is painted upon her sail.

Sec. 6. It shall be the duty of the person for the time being in charge of the watch-boat to report at once to the collector all violations, * * * and a failure to do so shall be a forfeiture of any wages that may be due him; and further, he shall not be allowed any longer to have charge of the watch-boat, and his place therein shall be vacant. * * * The possession or having the care and management of any oyster-boat shall, for the purposes of this act, be deemed and taken to be conclusive proof of ownership, * * * and all persons on board of her at the time of such violation shall be deemed and taken to be principal offenders, and be dealt with accordingly.

Sec. 7. It shall be the duty of the collector and the captain of the watch-boat to see that the name of any boat employed in planting or dredging for oysters is plainly painted on her stern, and a failure to do this, or a concealment of the name, shall be punished by the annulment of license and a refusal of license ever after.

Sec. 8. It shall be the further duty of the collector and captain to ascertain, at least once every month, and keep a record thereof, the name of the owner of every boat employed in the oyster business, and those on board of her shall give it to him, and the name given shall be taken to be the true name of such owner, who shall be held * * * an accessory before the fact to any violation * * * of this or the aforesaid acts, and liable accordingly. In case refusal be made to furnish the name of the owner, or there should be reason to believe that the true name is not given, it shall be the duty of those officers, respectively, to immediately take the boat itself into his custody, and detain her until the proper and right name be furnished; and to that end he shall have power to call upon and require, as he may in every other case of necessity, the sheriff of the county to aid him, which sheriff may employ any force or means whatever for that purpose.

Secs. 9 and 10. No license to plant oysters shall be granted until the applicant shall furnish the collector with a statement of the boat or boats to be employed by him in the business, giving separate name and tonnage, and the name of the owner and the persons who are to work her.

Sec. 11. The State Treasurer shall require from the collector * * * information, on the first day of June and September of each year, of the names and residences of all persons having license to plant oysters or dredge for them, and the names of the boats used in the business.

Sec. 12. When the captain of the watch-boat has knowledge of a violation of any of the provisions of this or the other acts with which this is connected, he shall proceed immediately to seize the boat or boats employed in such violation, and hold her or them in his custody until the collector has proceeded to enforce the provisions of this and the other of said acts.

Sec. 13. Neither the captain of the watch-boat, nor any of her crew, shall receive any pay for the time not actually and actively spent in the discharge of the duties required by this act, and the act to which this is a supplement, but such time shall be deducted in the computation of their wages.

Sec. 14. The captain and crew of the watch-boat shall be practical seamen, and part of their duty shall be to keep the boat, her apparel, tackle and furniture in good repair and condition, and this without extra charge; and no repairs involving extra expense shall be made without the concurrence of both the collector and captain, and then only such as are authorized by law.

Sec. 15. The collector shall issue no license nor permit any boat to dredge until the price or fee for said license has been actually paid, and the collector violating this provision shall not only be responsible for said license fee, but shall, in addition thereto, forfeit a like sum to the State.

Sec. 16. The collector shall keep a true, accurate list of all licenses issued by him, giving the name of every boat and captain thereof, respectively, with the amount paid for each license, which list he shall publish in at least one newspaper in Dover, the first week in April and October each year.

Sec. 17. The collector shall keep a separate account in the Farmers' Bank at Dover of all moneys received by him for license issued, and shall deposit weekly, all moneys received by him therefor; and all disbursements which he is or may be authorized by law to make, shall be by checks drawn on said fund in his official capacity.

SEC. 18. When the boundary stakes required by the act to which this is a supplement, have once been set, it shall be neither a defense nor excuse for any person prosecuted for a violation of any of the provisions of this act, or the act to which this is a supplement, that they were not standing or visible at the time the alleged offence was committed; but if the person accused be proven to have taken oysters anywhere but on his own ground, he may be properly convicted.

SEC. 19. Repeals section 6 of chapter 363, laws of 1873.

SEC. 20. The sum of $300 is to be set apart annually, from the oyster-fund of Kent county, to the improvement of certain roads along the shore. "And in order to facilitate such improvement, it shall be the duty of all oystermen to land and deposit their oyster-shells on shore, at some convenient place to said road, so that they may be used in said repairs, and it shall be unlawful to empty or throw such shells into the water, unless the distance from the place shall be so great as to make it unreasonable to land and deposit them as aforesaid, of which unreasonableness the collector and road-overseer shall concurrently be the judges."

SEC. 21. The foregoing act to be printed and distributed to owners of boats.

Under the operation of these laws there were registered, in 1879, 62 boats. The proceeds of their license-fees amounted to $5,324. The statistics for 1880 were not available in time for this writing, but will not greatly differ from those of the previous year. Many of the boats take out a dredging-license only, and do not pay the extra $25 which entitles them to plant.

SECTION VII.—THE OYSTER LAWS OF VIRGINIA.

The State of Virginia does not permit dredging, and the revenues of the State are collected by a system of taxation upon all oysters sold.

The laws are unsatisfactory, and are undergoing continual change. For this reason it does not seem advisable to print them in full, and we therefore give abstracts of some of them, and quote in full only those which relate to the system of taxation and to oyster planting.

The laws relating to the Potomac River and to Pokomoke Sound have been given in a preceding chapter.

The other laws of Virginia are in effect as follows:

The catching of oysters on Sunday, or between one hour after sunset and one hour before sunrise, is prohibited by the Act of March 6, 1882, under a fine of not less than $50 nor more than $100, and the forfeiture of the vessel used; and the informer receives one-half of the net proceeds of the sale of vessel.

According to section 23 of the Act of March 6, 1880, any person who catches oysters with tongs, between May 15 and September 1, shall be fined not less than $10 nor more than $50 for each offence; but any person may take two bushels a day for family use, and the owners of planted oysters may take them for family use at any time.

According to section 25 of the same Act, any person who plants oysters, or purchases them for planting, between May 15 and September 1, shall be fined not less than $10 nor more than $50 for each offence; but citizens of Westmoreland and Northumberland counties may take oysters in the Potomac, for planting in tributaries of the Potomac.

Any person who takes oysters with any instrument except oyster-tongs shall be confined in the penitentiary for not less than one nor more than three years, and the boat shall be forfeited to the State and sold at public auction by the Sheriff within ten days after conviction; and one-half of net proceeds shall be paid to the captor and 10 per centum shall be paid to the Sheriff. (Act of March 6, 1880, secs. 1, 2, 3).

According to Act of February 6, 1880, any resident who wishes to take oysters with tongs, for sale, must first be registered by inspector, and must receive and exhibit registration number, and he must pay an amount equal to the tax imposed by law upon the probable amount of his sales for the next three months; and on the first day of December, or as soon thereafter as practicable, he shall, under oath, to said inspector, make a statement of his actual sales; and he shall pay the deficiency or receive the surplus; and the like advances and the like settlement shall be made in each successive period of three months; and upon failure to comply with the law, he shall be fined not less than $5 nor more than $25 for each offence.

According to the sections 21, 22 and 43 of the Act of March 6, 1880, if any person who is not a taxpayer, and who has not resided in the State for twelve months next preceding, shall catch or plant oysters in Virginia, or in the Potomac River, or in Pocomoke sound, and if any resident shall be concerned or interested with such non-resident, in catching or planting oysters, or shall knowingly permit such non-resident to catch or plant oysters in his name, said person shall forfeit $500 and the vessel employed.

If any person shall unlawfully remove planted oysters or shells, he shall, if the amount taken be of less value than $50, suffer the penalty for petit larceny, and should the value be greater than $50, he shall suffer the penalty for grand larceny. (Act March 6, 1880, sections 41, 42).

No person shall catch oysters for manufacture of lime, under penalty of $50 for each hundred bushels. (Act March 6, 1880, section 24).

All oysters in shell must be measured in a lawful measure, sealed by an oyster inspector of the county, and all other oysters shall be sold by standard wine measure, under penalty of not less than $10 nor more than $50 for each offence. (Act March 6, 1880, secs. 26, 27, 28, 29).

No person shall stake in, for planting oysters or shells, any natural bed, and it shall be the duty of inspectors to require all persons violating the provisions of this act, to remove all oyster stakes or other obstructions, and if any person fails to comply with such notice, the obstructions shall be removed by inspector, at the cost of the offender, who shall be liable to a penalty of not less than $10, nor more than $1,000.

Act of March 6, 1882.

1. *Be it enacted by the General Assembly of Virginia*, That all that portion of Hampton flats and the grounds thereof, lying in and adjacent to the county of Elizabeth City, commencing at the mouth of Hampton Creek and running along the shore line, at low water mark, to the mouth of Salter's (or Salford's) Creek, and included between the said low water-mark along said shore line and a line commencing at Pettycoat Bony, at the mouth of said Hampton Creek, and running thence in a southwesterly direction to the Newport News Point, be and they are hereby declared open and eligible for the planting of oysters for the period of twenty years from the passage of this act, subject to the provisions hereinafter contained.

2. That if any person resident within this State shall be desirous of sowing or planting oysters on any of said flats or grounds hereinbefore described, such person may apply to the inspector of oysters for the county in which said flats or grounds are located, or to which they are adjacent, stating as near as may be the quantity proposed to be planted or sowed, and the said inspector shall assign to such person, on such portion of said flats or grounds as may be agreed upon between them, so much of the said flats or grounds as may be necessary for the quantity of oysters, so to be planted or sowed. Such person shall cause the same to be marked and laid off with suitable stakes, according to assignment, and thereafter the exclusive right of planting or sowing oysters on such grounds, so assigned, shall be vested in such person for the period of one year, with the privilege of renewing the same from year to year, upon such terms as may be prescribed by law while this act shall be in force.

3. That where any of the said flats or grounds hereinbefore described are now used or occupied by any person a resident of this State for the planting or sowing of oysters, the inspector, in making assignment of such ground so used or occupied, shall give preference to such person or persons so using or occupying the same as aforesaid.

4. That all oysters sowed or planted on the flats or grounds aforesaid shall be subject to the tax and restrictions imposed upon planted oysters and the planting thereof, prescribed by sections five, sixteen, twenty-one, twenty-two, twenty-three, twenty-four, twenty-five, twenty-six and twenty-seven of an act for the preservation of oysters and to obtain revenue for the privilege of taking them within the waters of this commonwealth, approved April 18, 1874, so far as the same are applicable thereto.

5. This act shall be in force from its passage.

Act of February 16, 1880.—State Property in Oysters.

1. All the beds of the bays, rivers and creeks, and the shores of the sea within the jurisdiction of this commonwealth, and not conveyed by special grant or compact according to law, shall continue and remain the property of the commonwealth of Virginia, and may be used as a common by all the people of the State for the purpose of fishing and fowling, and of taking and catching oysters and other shell fish, subject to the reservations and restrictions hereinafter imposed.

2. No grant shall hereafter be issued by the register of the land office to pass any estate or interest of the commonwealth in any natural bed, rock or shoal, whether the said bed, rock or shoal shall ebb bare or not.

Rights of Land Owners.

3. If any creek, cove or inlet makes into or runs through the land of any person, and is comprised within the limits of his lawful survey, such person or other lawful occupants shall have the exclusive right to use said creek, cove or inlet for sowing or planting oysters or other shell fish, notwithstanding the reservation hereinbefore made.

4. The rights of the owners or occupants of land on any of the other shores, bays, rivers or creeks within the jurisdiction aforesaid, shall extend to ordinary low water mark; but it is not intended hereby to deprive them of the privilege extended to others by the first section of this act.

Tax on Planted Oysters.

5. It shall be the duty of the township assessor when he assesses the other property of his township to require all persons depositing or planting oysters or shells to state (upon oath) the cash value of all such oysters or shells deposited or planted during the preceding year, which amount shall be entered by the assessor in his books in a separate column, and the person thus depositing or planting such oysters or shells shall pay a tax upon their assessed value equal to the tax imposed upon other species of property, and the said tax shall be collected by the treasurer or collector of the county, township or corporation as other taxes are collected. The treasurer of such county or corporation shall report to the auditor of public accounts the amount so collected. Any person failing to comply with the provisions of this section shall be fined in a sum not less than ten nor more than five hundred dollars.

Planting Oysters—What to be Paid for the Privilege.

6. If any owner or occupier of land, having a water front thereon suitable for planting oysters, shall be desirous of obtaining a location thereon for planting them exclusively for the use of his family, he may make application to any inspector for the county in which he resides, who shall assign to him, on such location as such owner or occupant may designate, in front of his land, a quantity sufficient for the said purpose, to be judged by said inspector, subject to appeal to the judge of the county court of the county in which said land is located, either in term time or vacation, who is hereby authorized to take cognizance of the same and make such assignment as shall seem proper, provided that the said assignment shall not exceed one-half of an acre; and provided further, that the privilege thus accorded to the riparian owner may at any time be revoked at the pleasure of the General Assembly. It shall be the duty of such owner or occupant to cause the same to be marked with suitable stakes, according to the assignment, and thereafter he shall have the exclusive right to the use thereof for the purposes aforesaid: and this privilege is accorded to said owner or occupant in consideration of the extra valuation ordinarily assessed upon such land for the water privilege supposed to attach thereto; provided, however, that if said owner or occupant shall sell any oysters from said reservation he shall pay a tax of fifty cents on every hundred dollars' worth so sold by him. The inspector making the assignment of reservation shall be paid by such owner or occupant a fee of one dollar.

CHAPTER XI.

An Act to Encourage the Cultivation of Oysters and to Protect and Develop the Oyster Industry of the Chesapeake Bay and its Tributaries.

In the body of our report we have given all the information which we have been able to obtain from all sources regarding the protection and development of the oyster industry, and we have also made many recommendations with reference to the development of our own fisheries.

While we feel that, in doing this we have performed, to the best of our ability, the duty required of us, we also feel that the ground covered is so extensive and the complexity of the subject is so great, that much labor will be saved if our various recommendations are presented in the form of a bill.

We therefore respectfully ask to call your attention to the recommendations in chapter VIII, page 134, and also to the accompanying bill, for the "Encouragement of Oyster Cultivation and for the Protection and Development of our Oyster Industry."

Be it enacted by the General Assembly of Maryland, That the owner or owners, or other lawful occupant or occupants of any land bordering on any of the navigable waters of this State, the lines of which extend into and are covered by said waters, shall have the exclusive right to use the same, within said lines, for the cultivation of oysters.

And be it enacted, That the owner or owners, or lawful occupant or occupants of any land bordering upon any creek, cove or inlet, shall have the exclusive right to use said creek, cove or inlet, for the cultivation of oysters, above the line where said creek, cove or inlet first ceases to be more than one hundred yards wide at mean low-tide mark.

And be it enacted, That any one who shall construct an artificial pond upon land of which he is the owner or lawful occupant for the cultivation of oysters, shall own said pond and its contents.

And be it enacted, That when the owner or lawful occupant of any land in which there may be any salt water creek, cove or inlet, shall desire to dam, gate or lock the same for an oyster pond, for the cultivation of oysters, he may make written application therefor to the oyster commissioners, who shall visit and examine it, and if, in their opinion, to dam it will not injure navigation or deprive the public of any rights or privileges, they shall mark off or set bounds where a dam may be built, and the owner of said lands may then construct and maintain such dam, gate or lock during the pleasure of the General Assembly.

And be it enacted, That any citizen of Maryland may make application under oath in writing to the Circuit Court of any county, for a permit to locate and appropriate five acres of bottom, not already located and appropriated, for the cultivation of oysters, which application shall be in the manner and form following, or of the terms and effect following, to wit:

Application for a Permit to Cultivate Oysters in ..... County.

I, ..., of the county or city of ....., in the State of Maryland, respectfully show that I am a citizen of Maryland; that the grounds hereinafter designated are not already appropriated; that I wish to use said grounds for the cultivation of oysters; that I hold no permit in any county of Maryland, to cultivate oysters upon grounds which, together with the ..... acres herein applied for, amount to more than five acres. I therefore respectfully ask that, pursuant to section ..... of an act entitled "An Act to encourage the cultivation of oysters," passed by the General Assembly of Maryland, ..., 188...., you will issue

to me a permit to cultivate oysters upon the ..... acres of ground located under the waters of ..... county, and more particularly bounded and described as follows, to wit:.....

Dated at ....., Maryland, this ..... day of ....., A. D., 188....

....., Applicant.

Personally appeared before me the above named ....., and made oath that the above-named statements are true.

....., Justice of the Peace.

And be it enacted, That the clerk of the Circuit Court of the county in which grounds applied for as above are located, shall enter the above application in a book kept for the purpose, and he shall immediately cause an accurate survey of the said grounds to be made, at the expense of the party applying for the same, and if said grounds are not already appropriated, and if the appropriation of them will not injure, obstruct or impede the free navigation of said waters, he shall, after said applicant has paid him the costs of surveying and one dollar for each acre, issue to said applicant a permit, in the manner and form following, to wit:

Whereas, ..., a citizen of Maryland, has made application for a permit to cultivate oysters upon the grounds hereinafter described, under the provisions of section ..... of an act entitled "An act to encourage the cultivation of oysters," passed by the General Assembly of the State of Maryland, A. D., 188....; and whereas, said ..... has complied with all the conditions of said act; now, therefore,

Know all men by these presents, that the State of Maryland, acting by and through the clerk of the Circuit Court of ..... county, in consideration of the premises, and especially in consideration of the sum of one dollar for each acre, duly received from said applicant, hath granted, and by these presents doth grant unto said ....., and to his legal representatives forever, the right to cultivate oysters in the ..... acres of ground bounded and described as follows; that is to say .....; to have and to hold the same unto the said grantee and his legal representatives forever: provided always, that such grounds have not hitherto been appropriated under the laws of Maryland, and provided that the appropriation of them shall not injure, impede or obstruct navigation, and provided that the said grantee shall at once cause said grounds to be plainly marked by stakes, buoys, bushes or ranges, which marks shall be continued by said grantee and his assigns, and provided that the name or the initials of the owner of said grounds shall be plainly stamped in letters at least one inch long upon a tag of sheet zinc attached to a stake at each corner of said ground, and visible at high water, and provided that the State of Maryland reserves the right to tax said ground and its contents, and provided also that this grant is accepted by the said grantee subject to all the provisions of the said act of Assembly.

In witness whereof, I, ..., clerk of the Circuit Court of ..... county, in the State of Maryland, have hereunto set my hand and affixed my official seal on this ..... day of ....., 188....

...., *Clerk, &c.*

L. S.

And be it enacted, That within one year from the passage of this act all grounds appropriated under the act of 1880, chapter 198, shall be surveyed and marked as prescribed in the foregoing sections by the claimant thereof, and a license issued to him as therein also prescribed, except that he shall not be required to pay the consideration of one dollar per acre; and in default of such survey and marking the said grounds shall be opened to appropriation by any other applicant.

And be it enacted, That grounds held for the cultivation of oysters under this act may be attached or taken in execution in the same manner as real estate; and any holder of such grounds may assign his interest in them to any citizen of Maryland; provided that no person shall hold more than five acres at

one time under the provisions of section ... of this act, unless he shall inherit them or lawfully acquire them as herein provided; and provided that all assignments shall be acknowledged before a justice of the peace and recorded in the office of the clerk of the Circuit Court, in the county from which such license was issued, within thirty days after such acknowledgment, for which recording the said clerk shall be entitled to be paid as for recording a bill of sale of chattels.

And be it enacted, That the clerk of the Circuit Court of each county in which grounds may be thus located and appropriated for the cultivation of oysters, shall keep a book in which he shall record all applications for such grounds, together with the designation and description of such ground, and the license issued therefor, and all assignments of such grounds, a certified copy of the entries in which book shall be received in evidence in any controversy touching said ground.

And be it enacted, That as soon as may be after the passage of this act, and of any proceedings to appropriate ground under it, the clerk of the Circuit Court of each county in which such proceedings may be had shall cause to be made a map of such applications as shall be granted, and shall keep the same on file in his office for the inspection of any one interested therein; and such map shall be added to from time to time as appropriations are made.

And be it enacted, That the clerk of the Circuit Court of each county in which grounds shall be appropriated, under the provisions of this act, for the cultivation of oysters, shall make a monthly report to the State Oyster Commissioners of all grounds thus appropriated, together with the location and boundaries of such grounds.

And be it enacted, That the State Oyster Commissioners shall record, in a book kept for the purpose at their office, the location and boundaries of all grounds appropriated under this act for the cultivation of oysters; and that they shall also keep upon file at their office maps showing the location and boundaries of all such grounds; and that they shall provide the commander of each boat of the State Fishery Force with a similar map of all grounds thus appropriated in his district, and adjacent thereto; and that they shall require the commander of each boat of the State Fishery Force to examine each month the map of oyster grounds at the office of the clerk of the Circuit Court of each county which borders upon his district, and to copy from it into his own maps all grounds not already copied.

And be it enacted, That the lawful holder of any oyster ground designated under the provisions of this act shall own all oysters upon said ground, and shall be allowed to gather them, either in person or otherwise, at such times and in such manner as he may chose, at all times except on Sunday or between sunrise and sunset.

And be it enacted, That all disputes regarding the boundaries or ownership of grounds held under the provisions of this act, for the cultivation of oysters, shall be decided under the laws of Maryland, in the same manner as if said grounds were real estate.

And be it enacted, That nothing in this act shall be construed to deny the right of the State of Maryland to impose a tax upon oysters.

And be it enacted, That the bottom of the Chesapeake Bay and its tributaries within the State of Maryland shall be divided into areas, which shall be designated and known as the "Shore Oyster Fishery" and the "Deep-water Fishery," respectively. The Shore Oyster Fishery shall include and consist of all bottoms which are covered with water at mean low-water, and which lie within or on the landward side of the boundary line hereinafter described, and the Deep-Water Fishery shall include and consist of all bottoms on the deep water or bay side of the same line, to wit:

Commencing at the State line at Watkins' point, and situated in or about lat. 37° 54′ 38″ N., and long. 1° 52′ 50″ W. of the meridian of the City Hall of the city of New York; thence following the shore line to the south point of Little Annamessex river in about lat. 37° 57′ 30″ N., long. 1° 53′ 20″ W.; thence N. W. for about three-quarter nautical miles to a point west of Old House cove in lat. 37° 58′ 16″ N., long. 1° 53′ 35″ W.; thence following shore line to Flat Cap point in lat. 38° 2′ 3″ N., long. 1° 52′ 5″ W.; thence N. ½ W. about 2¼ nautical miles to Hazzard's point in lat 38° 4′ 10″ N., long. 1° 52′ 40″ W.;

thence N. W. about four nautical miles to the south point of Little island in lat. 38° 6′ 45″ N., long. 1° 56′ 35″ W.; thence to south point of Deal's island; thence following the shore line across Law's thoroughfare to Haines' point, lat. 38° 10′ 30″ N., long. 1° 56′ 55″ W.; thence N. by W. about 3½ nautical miles to Clay island light in lat. 38° 13′ 55″ N., long. 1° 58′ 10″ W.; thence S. by W. about 2⅝ nautical miles to Bishop's head in lat. 38° 12′ 45″ N., long. 2° 1′ 35″ W.; thence N. by W. about 1⅞ nautical miles to Hooper's strait light in lat. 38° 13′ 30″ N., long. 2° 3′ 50″ W.; thence W. by N. about 3⅜ nautical miles cross mouth of Honga river to south point of Hooper's island in latitude 38° 13′ 45″ N., long. 2° 5′ W.; thence following shore line to Richland's point, lat 38° 14′ 22″ N., long 2° 10′ W.; thence N. W. to south point of Barren island, lat. 38° 18′ 40″ N., long. 2° 14′ 45″ W.; thence following shore line across mouth of Slaughter's creek to the south point of creek south of Taylor's island in lat. 38° 35′ 25″ N., long. 2° 17′ 35″ W.; thence to James' point, lat. 38° 31′ 50″ N., long. 2° 20′ 45″ W.; thence N. E. about 2½ miles across mouth of Little Choptank river to Hill's point, lat. 38° 33′ 40″ N., long. 2° 18′ 30″ W.; thence following shore line to Castlehaven point, lat. 38° 37′ 40″ N., long. 2° 9′ 35″ W.; thence N. by E. for about ½½ of one nautical mile across the Choptank river to Chlora's point, lat. 38° 38′ 10″ N., long. 2° 8′ 35″ W.; thence N. W. about two and one-eighth nautical miles across the mouth of Treadhaven creek to Benoni's point, lat 38° 40′ 10″ N., long. 2° 11′ 15″ W.; thence W. ½ N. about five and two-thirds nautical miles across the mouths of Harris' creek, Broad creek and Irish creek to Blackwalnut point, lat. 38° 40′ 35″ N., long. 2° 19′ W.; thence S. W. about one and one-sixth nautical miles across the mouth of Blackwalnut creek to the south point of Tilghman's island, lat. 38° 39′ 50″ N., long. 2° 20′ W.; thence northwards along the west shore of Tilghman's island across the mouth of Paw-Paw cove to the north point of the mouth of Paw-Paw cove in lat. 38° 42′ N., long. 2° 20′ 40″ W.; thence following the coast line across the mouth of Knapp's narrows to Love point in lat. 38° 46′ 35″ N., long. 2° 19′ 45″ W.; thence following the shore line to Tilghman's point, lat. 38° 51′ 49″ N., long. 2° 14′ 42″ W.; thence north about two and one-eighth nautical miles across Eastern bay to the south point of Parson's island in lat. 38° 59′ N., long. 2° 14′ 50″ W.; thence S. W. by W. about five and three-fourths nautical miles across the mouths of Shipping creek, Cox's creek and Crab Alley creek to Kent point, lat. 39° 50′ N., long. 2° 21′ 50″ W.; thence northward along the western shore of Kent island to south point of the mouth of Broad creek in lat. 38° 58′ 25″ N., long. 2° 21′ W.; thence north along the western shore of Kent island to Love point in lat. 39° 2′ 10″ N., long. 2° 17′ 50″ W.; thence following shore line along the north shore of Kent island and the south shore of Chester river to Carpenter's island in lat. 39° 1′ 10″ N., long. 2° 10′ W.; thence S. W. by W. ¼ W. for about 1⅛ nautical miles across Chester river to Hail point, lat. 39° 35″ N., long. 2° 11′ 20″ W.; thence along the western shore of Eastern Neck island, and Eastern neck to Wilson's point; thence following the shore line of Eastern Neck island, and Eastern neck to Wilson's point; thence following the shore line of Eastern neck to Huntingfield point, lat. 39° 7′ 10″ N., long. 2° 13′ 40″ W.; thence N. W. ½ W. about one and one-sixth nautical miles across the mouths of Huntingfield creek, Rockhall creek and Swan creek to Swan point, lat 39° 11′ 40″ N., long. 2° 16′ 25″ W.; thence following shore line to Mitchell's bluff, lat. 39° 13′ 20″ N., long. 2° 24′ 5″ W.; thence following shore line to west point of mouth of Earley's creek, lat. 39° 16′ 4″, long. 2° 12′ 15″ W.; thence N.W. by N. about three nautical miles across mouths of Earley's creek and Wharton creek to Wharton point, lat. 39° 18′ 55″ N., long. 2° 10′ 50″ W.; thence N. W. about 2½ nautical miles across the Susquehanna river to east point of mouth of Bush river, lat 39° 20′ 45″ N., long. 2° 13′ 17″ W.; thence S. W. about 1¼ nautical miles across mouth of Bush river to Lego's point, lat. 39° 20′ N., long. 2° 14′ 45″ W.; thence following shore line to Robin's point, lat 39° 17′ 50″ N., long. 2° 16′ 23″ W.; thence S. by W. about four nautical miles across the mouths of Gunpowder river, Seneca creek, Middle river, Back river and Hawk cove to north point of Miller's island, lat. 39° 25′ 50″ N., long. ° 20′ 50″ W.; thence following shore line to rear light of Craighill channel, lat. 39° 13′ 40″ N., long. 2° 3′ 15″ W., and from rear light of Craighill channel in lat. 39° 13′ 40″ N., long 2° 23′ 15″ W.; along coast line to upper tower of North point in lat. 39° 11′ 46″ N., long. 2° 26′ 36″ W.; thence S. E. by S. about two and one-fourth nautical

miles to Rock point, lat. 39° 9′ 55″ N., long. 2° 28″ 20″ W.; thence along coast line to Stony point, on Gibson's island, in lat. 39° 3′ 30″ N., long. 2° 25′ 30″ W.; thence about one and one-half nautical miles across the mouth of Magothy river to Persimmon point, on the east of the mouth of Deep creek, in lat. 39° 3′ 10″ N., long. 2° 26′ W.; thence along coast line to Hackett's point in lat. 38° 59′ N., long. 2° 25′ 10″ W.; thence S. by W. ½ W. about four and three-fourths nautical miles across the mouths of Severn river, Mill creek and Whitehall creek to Thomas' point in lat. 38° 54′ 25″ N., long. 2° 26′ 50″ W.; thence S. by E. ½ E. about two and one-sixth nautical miles across the mouth of South river to Saunder's point, lat. 38° 53′, long. 2° 28′ 55″ W.; thence south about two and three-fourths nautical miles across the mouths of West river and Rhode river to Horseshoe point, lat 38° 50′ 20″ N., long. 2° 28′ 50″ W.; thence W. by S. about one and seven-twelfths nautical miles to Franklin point; thence S. W. by W. about three and one-half nautical miles to the south point of Parker's island, at the north of the mouth of Herring bay, in lat. 38° 46′ 10″ N., long. 2° 32′ W.; thence S. W. about two and one-half nautical miles across the mouth of Herring bay to Holland point in lat. 38° 43′ 45″ N., long. 2° 31′ 10″ W.; thence following coast line to Parker's creek in lat. 38° 32′ 6″ N., long. 2° 30′ 45″ W.; thence following shore line to Cove point light, lat. 38° 23′ 7″, long. 2° 22′ 36″ W.; thence following shore line to Drum point, lat. 38° 18′ 58″ N., long. 2° 25′ W.; thence due south one nautical mile across the mouth of the Patuxent river to a point due S. of Drum point; thence following shore line across mouths of Harper's creek, Parson's creek and St. Jerome's creek to Point Lookout, lat. 38° 2′ 16″ N., long. 2° 19′ W.; thence S. W. about ten nautical miles to Smith's point, on the boundary line between Maryland and Virginia; provided that the bottoms of all creeks, bays and inlets, which are not mentioned in this section, and are not more than one mile wide at their mouths, shall be included in the Shore Oyster Fishery; and provided also, that the Deep-Water Oyster Fishery shall end at the line where any creek, bay or inlet, not otherwise mentioned in this section, ceases to be more than one mile wide.

And be it enacted, That the State of Maryland shall exercise exclusive jurisdiction over all oyster fisheries which now exist or which shall at any time exist in that area which is hereinbefore described as the Deep-Water Oyster Fishery.

And be it enacted, That the Deep-Water Oyster Fishery shall be divided into eleven districts, which shall be numbered in succession from the north to the south, and which shall be bounded by the lines herein described, to wit:

District No. 1.—This district shall be known as "District No. 1," and shall include all waters within the exclusive jurisdiction of the State to the northward and eastward of a line drawn from the rear light of Craighill channel, lat. 39° 13′ 40″ N., long. 2° 23′ 15″ W., about seven and one-eighth nautical miles east to Mitchell's bluff, lat. 39° 13′ 20″ N., long. 2° 24′ 5″ W.

District No. 2.—This district, which shall be known as "District No. 2," shall include all waters within the exclusive jurisdiction of the State between the following boundaries: On the north, a line from the rear light of Craighill channel, lat. 39° 13′ 40″ N., long. 2° 23′ 15″ W., about seven and one-eighth nautical miles east to Mitchell's bluff, lat. 30° 13′ 20″ N., long. 2° 24′ 5″ W.; on the east by the shore line from Mitchell's bluff to Swan point, lat. 39° 11′ 40″ N., long. 2° 16′ 25″ W.; on the south and west by a line from Swan point northwest about seven and five-twelfths nautical miles to the rear light of Craighill channel, lat. 39° 13′ 40″ N. long., 2° 23′ 15″ W.

District No. 3.—This district, which shall be known as "District No. 3," shall include all waters within the exclusive jurisdiction of the State between the following boundaries: On the northeast a line from the rear light of Craighill channel, lat. 39° 13′ 40″ N., long. 2° 23′ 15″ W.; southeast for about seven and five-twelfths nautical miles to Swan point, lat. 39° 11′ 4″ N., long. 2° 16′ 25″ W.; on the east by a line from Swan point, southeast ½ east, about one and five-sixths nautical miles across the mouths of Swan creek, Rockhall creek and Huntingfield creek to Huntingfield point, lat. 39° 7′ 10″ N., long. 2° 13′ 40″ W.; thence following coast line of Eastern neck to Wilson's point, thence along the west side of Eastern neck and Eastern neck island to Hail point, lat. 39° 35′ N., long. 2° 11′ 20″ W.; thence N. E.

by E., ¼ E. for about one and one-eighth nautical miles across Chester river to Carpenter's island, lat. 39° 1′ 10″ N., long. 2° 10′ W.; on the south by the shore line of the south shore of Chester river and the north shore of Kent island to Love point, lat. 39° 2′ 10″ N., long. 2° 17′ 50″ W.; thence along the west shore of Kent island to the south point of the mouth of Broad creek, lat. 38° 58′ 25″ N., long. 2° 21′ W.; and from thence W. by N. about three and seven-eighth miles to Hackett's point, lat. 38° 59′ N., long. 2° 25′ 10″ W.; on the west by a line from Hackett's point along coast line to Persimmon point, on the east of the mouth of Deep creek, lat. 39° 3′ 10″ N., long. 2° 26′ W.; thence about one-half a nautical mile across the mouth of Magothy river to Stony point on Gibson's island, lat. 39° 3′ 30″ N., long 2° 25′ 30″ W.; thence along the coast line to Rock point, lat. 39° 9′ 55″ N., long. 2° 28′ 20″ W.; thence N. E. by N. about two and one-fourth nautical miles to upper tower of North point, lat. 39° 11′ 45″ N., long. 2° 26′ 40″ W.; thence along coast line to rear light of Craighill channel, lat. 39° 13′ 40″ N., long. 2° 23′ 15″ W.

District No. 4.—This district, which shall be known as "District No. 4," shall include all waters under the exclusive jurisdiction of the State, within the following lines: On the north by a line from Hackett's point, lat. 38° 59′ N., long. 2° 25′ 10″ W., E. ½ S. about three and seven-eighths nautical miles to the south point of the mouth of Broad creek, on the west shore of Kent island, lat. 38° 58′ 25″ N., long. 2° 20′ W.; on the east by the coast line of the western shore of Kent island, from Broad creek to a point on Kent island, in the range of Thomas' point and Thomas' point light, and in about lat. 38° 54′ 10″ N., long. 2° 21′ 40″ W.; on the south by a line W. ½ N. about four and one-fourth nautical miles to Thomas' point, lat. 38° 54′ 25″ N., long. 2° 26′ 50″ W.; on the west by a line N. by E. ¼ E., about four and three-fourths nautical miles across the mouths of Whitehall creek, Mill creek and Severn river to Hackett's point, lat. 38° 59′ N., long. 2° 25′ 10″ W.

District No. 5.—This district, which shall be known as "District No. 5," shall include all the waters under the exclusive jurisdiction of the State, within the following boundaries: On the north by a line from Thomas' Point, E. ½ S. about four and one-fourth nautical miles to a point on the west shore of Kent island, in range of Thomas' point and Thomas' point light, and in about lat. 38° 54′ 10″ N., and long. 2° 21′ 40″ W.; on the east by the shore line of the west shore of Kent island to Kent point, lat. 38° 50′ N., long. 2° 21′ 50″ W., thence N. E. by E., for about five and three-fourths nautical miles across the mouths of Shipping creek, Coxe's creek and Crab Alley creek, to the south point of Parson's island, lat. 38° 59′ N., long. 2° 14′ 50″ W., thence south about two and one-eighth nautical miles across Eastern bay to Tilghman's point, thence along the shore line to Low point, lat. 38° 46′ 35″ N., long. 2° 19′ 45″ W.; on the south by a line from Low point west by north about one and one-fourth nautical miles to the north point of Poplar Island, lat. 38° 46′ 45″ N., long. 2° 22′ W.; thence W. ½ S. about seven and five-eighths miles to Parker's island, at the north of the mouth of Herring bay, in lat. 38° 46′ 10″ N., long. 2° 32′ W.; on the west by a line from the south point of Parker's island N. E. by E. about three and one-half nautical miles to Franklin point, thence E. by N. about one and seven-twelfths nautical miles to Horseshoe point, lat. 38° 50′ 20″ N., long. 2° 28′ 50″ W., thence north about two and three-fourths nautical miles across the mouths of Rhode river and West river to Saunder's point, lat. 38° 53′ N., long. 2° 28′ 55″ W., thence N. E. ½ E. about two and one-sixth nautical miles across the mouth of South river to Thomas' point.

District No. 6.—This district, which shall be known as "District No. 6," shall include all waters under the exclusive jurisdiction of the State, within the following boundaries: On the north a line from the south point of Parker's island, E. ½ N. for about seven and five-eighths nautical miles to the north point of Poplar island, lat. 38° 46′ 45″ N., long. 2° 22′ W.; thence E. by S. about one and one-fourth nautical miles to Low point, lat. 38° 46′ 35″ N., long. 2° 19′ 45″ W.; on the East by coast line across the west mouth of Knapp's Narrows to the north point of Paw Paw cove on the west shore of Tilghman's island, in lat. 38° 42′ N., long. 2° 20′ 40″ W.; on the South by a line from the north point of the mouth of Paw Paw cove N. by W., about 8¾ nautical miles from Holland point, lat. 38° 43′ 45″ N., long. 2° 31′ 10″ W.; on the west by a line from Holland point N. by W. about two and one-half nautical miles across the mouth of Herring bay to the south point of Parker's island, lat. 38° 46′ 10″ N., long. 2° 32′ W.

District No. 7.—This district, which shall be known as "District No. 7," shall include all waters within the exclusive jurisdiction of the State within the following boundaries: On the north a line from Holland point S. by E. about eight and one-third nautical miles to the north point of Paw Paw cove, on the west shore of Tilghman's island, in lat. 38° 42′ N., long. 2° 20′ 40″ W.; thence southward along the west shore of Tilghman's island, across the mouth of Paw Paw cove to the south point of Tilghman's island, lat. 38° 49′ 50″ N., long. 2° 20″ W.; thence N. E. about one and one-sixth nautical miles across the mouth of Blackwalnut cove to Blackwalnut point, lat. 38° 40′ 35″ N., long. 2° 19′ W.; thence E. ½ S. about five and two-third nautical miles across the mouths of Harris creek, Broad creek and Irish creek to Benoni's point, lat 38° 40′ 10″ N., long. 2° 11′ 15″ W.; thence S. E. about two and one-eighth nautical miles across the mouth of Treadhaven creek to Chlora's point, lat. 38° 38′ 10″ N., long. 2° 8′ 35″ W.; on the south and east by a line from Chlora's point S. by W. about eleven-twelfths of one nautical mile across the Choptank River to Castlehaven point, lat. 38° 37′ 30″ N., long. 2° 9′ 35″ W.; thence following the shore line to Hill's point, lat. 38° 33′ 40″ N., long 2° 18′ 30″ W.; thence S. W. about two nautical miles across the Little Choptank river to James' Point, lat. 38° 31′ 50″ N., long. 2° 20′ 45″ W.; on the south by a line west from James' point about seven and three-fourths miles to Parker's creek, lat. 38° 32′ 62″ N., long. 2° 30′ 45″ W.; on the west by the coast line from Parker's creek to Holland point, lat. 38° 43′ 45″ N., long. 2° 31′ 10″ W.

District No. 8.—This district, which shall be known as "District No. 8," shall include all waters under the exclusive jurisdiction of the State within the following boundaries: On the north a line from Parker's creek, lat. 38° 32′ 6″ N., long- 2° 30′ 45″ E., about seven and three-fourths nautical miles to James' point, lat. 38° 31′ 50″ N., long. 2° 20′ 45″ W.; on the east by the shore line from James' point to the south point of the mouth of a creek at the south end of Taylor's island in about lat. 38° 35′ 25″ N., long. 2° 19′ 35″ W.; on the south by a line from this point S. W. by W. about 4½ nautical miles to Cove Point light, lat. 38° 23′ 6″ N., long. 2° 22′ 35″ W.; on the west by the shore line from Cove Point light to Parker's creek, lat. 38° 32′ 6″ N., long. 2° 30′ 45′′ W.

District No. 9.—This district, which shall be known as "District No. 9," shall include all waters within the exclusive jurisdiction of the State within the following boundaries: On the north by a line northwest about 4½ nautical miles to the mouth of a creek on the west shore on Taylor's Island, lat. 38° 35′ 25″ N., long. 2° 17′ 35″ W.; thence along the shore line and chain of islands to south point of Barren island, lat. 38° 18′ 40″ N., long. 2° 14′ 45″ W.; thence southeast across mouth of Tar bay and along west coast of Hooper's island to Richland point, lat. 38° 14′ 22″ N., long. 2° 10′ W.; thence across Richland cove and mouth of Honga river to Hooper's strait light, lat. 38° 13′ 30″ N., long. 2° 3′ 50″ W.; on the south by a line southwest and west about 13 nautical miles to Point No Point, in lat. 38° 8′ 20″ N., long. 2° 18′ 55″ W.; on the west by shore line from Point No Point to a point on the south shore of the Patuxent river due south of Drum point; from thence north about one nautical mile across the Patuxent river to Drum point; thence following shore line to Cove point light.

District No. 10.—This district, which shall be designated and known as "District No. 10," shall include and consist of all waters within the exclusive jurisdiction of the State within the following boundaries, to wit: On the north a line from Point No Point, in lat. 38° 8′ 20″ N., long. 2° 18′ 55″ W.; N. E. by E. about twelve and seven-eighths miles to Hooper's strait light, in lat. 38° 12′ 57″ N., long. 2° 4′ 48″ W.; thence E. by S. about one and seven-eighths nautical miles to Bishop's head, in lat. 38° 12′ 45″ N., long. 2° 1′ 35″ W.; thence N. E. by E. about two and seven-eighths nautical miles across mouth of Fishing bay to Clay island light; thence south by east about two and one-third nautical miles across mouths of Nanticoke river and Monie bay to Haines' point; thence south across mouth of Law's thoroughfare and along west shore of Deil's island and across the mouth Lower Thoroughfare to S. W. point of Little island, in lat. 38° 6′ 45″ N., long. 1° 56′ 35″ W.; thence S. W. about five nautical miles to Solomon's lump light, lat. 38° 2′ 49″ N., long. 2° 0′ 32″ W.; thence W. by S. about fourteen and one-half nautical miles to Point Lookout, in lat. 38° 2′ 26″ N., long. 2° 19′ 1′′ W.; thence along shore line to Point No Point, in lat. 38° 8′ 20″ N., long. 2° 18′ 55″ W.

District No. 11.—This district, which shall be designated and known as "District No. 11," shall include and consist of all waters under the exclusive jurisdiction of the State within the following boundaries, to wit: On the north a line from Point Lookout, in lat. 38° 2′ 16″ N., long. 2° 19′ 1″ W.; E. by N. about fourteen and one-half nautical miles to Solomon's lump light, in lat. 38° 2′ 49″, long. 2° 0′ 32″; from Solomon's lump light N. E. about five nautical miles to southwest point of Little island, in lat. 38° 6′ 45″ N., long. 1° 56′ 35″ W.; thence S. E. about five nautical miles to Hazzard's point, lat. 38° 4′ 10″, long. 1° 52′ 40″ W.; thence S. ½ E. about two and one-fourth nautical miles to Flat Cap point, in lat. 38° 2′ 3″ N., long 1° 52′ 5″ W.; thence following shore line to a point west of Old House cove, in lat. 37° 58′ 20″, long. 1° 52′ 40″; thence S. E. for about ¾ nautical miles across the mouth of the Little Annamessex river to the south point of its mouth, in lat. 37° 57′ 30″, long. 1° 52′ 30″; thence following shore line to Watkins' point, in lat. 37° 54′ 38″ N., long. 1° 52′ 50″ W.; on the south by the boundary between Maryland and Virginia, westward from Watkins' point for about 17 nautical miles to Smith's point, at the mouth of Little Wicomico river, in Virginia, in lat. 37° 53′ 8″ N., long. 2° 13′ 45″ W.; on the west by a line N. W. by N. about ten and one-half nautical miles from said point on State line to Point Lookout, in lat. 38° 2′ 16″ N., long. 2 19′ 1″ W.

And be it enacted, That the commander of the State Oyster Navy shall erect at all points where, in the judgment of the State Oyster Commissioner such marks are necessary, permanent signals or beacons or buoys to mark the boundary of the adjacent districts, and to be used as landmarks in designating oyster grounds according to the provisions of this act.

And be it enacted, That the districts of the Deep-Water Oyster Fishery herein named, to wit: District No. 2, district No. 4, district No. 6, district No. 8 and district No. 10 shall be closed to the public, and no date at which they shall be opened shall be fixed at this time, and the said districts shall be designated and known as the "Closed Waters of the Deep-Water Oyster Fishery." They shall be left to recuperate as well as to serve as a source of spat for the adjacent districts, and no person or persons shall be allowed to take oysters from the said districts in any manner; provided that nothing in this act shall be construed to prevent any person who holds any ground for the cultivation of oysters under the provisions of this act, herein stated, from taking oysters in such manner as said person may elect, at any time between sunrise and sunset, except on Sundays.

And be it enacted, That the oyster commissioners shall, each year, make careful and thorough examinations of all the oyster beds known to them in the said districts, to wit: "District No. 2," district No. 4," "district No. 6," district No. 8," district No. 10," and they shall make an annual report to the General Assembly, detailing the results of such examination, and whenever, in their judgment, these districts, or any of them, are sufficiently restored, they shall recommend to the General Assembly that they be opened to the public for the taking of oysters, and they shall also designate another district or portion of a district, of equivalent or nearly equivalent area, and shall recommend that it be closed.

And be it enacted, That the district herein described as district No. 4 shall be set apart as a State oyster farm, and the oyster commissioners shall cause the bottom of said area to be shelled, and they shall employ all means known to them for speedily and thoroughly restoring the oyster beds of said area to a prosperous condition.

And be it enacted, That whenever application shall be made in the manner and form hereinafter described by any person who has resided in the State for not less than one year next preceding the date of such application to the State oyster commissioners, for the right to cultivate oysters upon designated and unoccupied portions of district No. 6. ....., the said commissioners shall direct the commander of the State Fishery Force to survey the area thus applied for and to locate and delineate it upon a map of district No. 6, which shall be deposited in the office of the oyster commission.

The application to the oyster commissioners shall be in the following form:

Application for a Grant to the Oyster Commissioners of the State of Maryland.

The application of ....., a resident of the town (or county) of ....., in the State of Maryland, respectfully shows: that he has resided in said State more than one year next preceding the date of this application; that the grounds, hereinafter described, are undesignated grounds: that he wishes and intends to use said grounds for cultivating oysters. He, therefore, respectfully request that the said commissioners, pursuant to ....., will grant to him, in the name and behalf of the State of Maryland, a perpetual franchise for cultivating oysters in ..... acres of grounds, located under the waters of Maryland, within the limits of District No. 6, which grounds are more particularly bounded and described as follows, to wit: .....

Dated at ....., Maryland, this ..... day of ....., A. D. 188...

....., *applicant.*

And be it enacted, That as soon as said map has been prepared by the State Fishery Force, and is deposited in the office of the State Oyster Commission, the said Oyster Commissioners shall publish the following notice in three daily ..... papers published in the State:

Notice is hereby given, that whereas ....., a resident of the ....., in the State of Maryland, has filed an application with the Oyster Commissioners of the State of Maryland, requesting said commissioners to grant to him, in the name and behalf of the State of Maryland, a perpetual franchise for cultivating oysters in ..... acres of ground, located in District No. 6, in the State of Maryland, and particularly bounded and described as follows, to wit: .....

Therefore the said Commissioners do hereby give notice that they will sell the perpetual right to cultivate oysters upon the above prescribed tract to the highest bidder, who shall be a citizen of Maryland, at public auction, at ....., thirty days (or thirty-one) from this date. The Oyster Commissioners, in behalf of the State, reserve the right to reject all bids.

Dated at ....., this ..... day of ....., A. D. 188

Signed,

.....

.....

.....

Oyster Commissioners of the State of Maryland.

And upon the day named in said notice, they shall sell the right to cultivate oysters upon the area named in said notice, at public auction, at the place named in said notice, provided that they shall have the right to reject all bids.

And be it enacted, That the highest bidder at said public sale shall, if he has been a resident of the State for at least one year next preceding, receive from the Oyster Commissioners, upon payment of the purchase money, a written lease, in the manner and form hereinafter stated, which shall convey to him and his heirs and assigns forever the right to cultivate oysters upon the area described in said lease, and to gather them at such times and in such manner as he shall desire, and which shall entitle said purchaser to protection, by the officers of the State, in the enjoyment of all the rights conveyed by said lease, provided that nothing in this act shall be construed to permit the taking of oysters on Sunday or in the night season; and provided that the oyster commissioners, in behalf of the State, reserve the right to reject all bids; and provided the State reserves the right to tax all oysters which may be upon the area designated in said lease, which lease shall be in the manner and form following, to wit:

Grant of Oyster Franchise.

Whereas, ..., resident of the State of Maryland, has purchased at public auction, from the Oyster Commissioners of the State of Maryland, the perpetual right to cultivate oysters upon the grounds hereinafter described; and whereas said grounds have been surveyed and mapped, and have been advertised for sale in .....,.. papers of the date of the ..... day of ....., A. D. 188 ; and whereas the sum of ..... has been paid by the said ..... to the said Oyster Commissioners for the benefit of the State of Maryland:

Now, therefore, know all men by these presents, that the State of Maryland, acting by and through the Oyster Commissioners, in consideration of the premises, and especially for the sum of ....., duly received from said ....., hath given and granted, and by these presents doth give and grant unto the said ..... and to ..... legal representatives forever a perpetual franchise for the cultivation of oysters, and for the gathering of the said oysters in such manner and at such time as ..... shall choose, either in person or otherwise, in the ..... acres of ground bounded as follows, that is to say: ..... To have and to hold the same unto the said grantee and ..... legal representatives, to the only use of the said grantee and ..... legal representatives forever.

Provided, that this grant shall not interfere with any established right of fishing, and shall not obstruct navigation; and provided that said grantee shall at once cause the said grounds to be plainly marked by stakes, buoys, ranges or monuments, which landsmarks shall be continued by said grantee and ..... legal representatives; and provided that the State reserves the right to tax the oysters which may be cultivated or obtained upon the area above described; and provided further that this grant is accepted by said grantee subject to all the aforesaid provisions.

In witness whereof, the Oyster Commisioners in behalf of the State of Maryland, by virtue of the authority vested in them by.....have hereto set their hands and seals this.....day of....., A. D. 188 .

Signed, sealed, and delivered in presence of

.... [L. S.]

.... [L. S.]

.... [L. S.]

..... Md. ...., A. D. 188 .

Personally appeared .... Oyster Commissioners of the State of Maryland, signers and sealers of the foregoing instrument, and severally acknowledged the same to be their free act and deed in behalf of the State of Maryland, and in their own behalf, before me,

Signature .....

Upon receipt of said instrument of conveyance, said grantee shall at once cause the grounds therein conveyed to be plainly marked out by stakes, bushes, buoys, ranges, or monuments, and he shall, at once, place at the northeast corner of said area a tag bearing plainly marked upon it his name or initials and the letters N. E., and at the northwest corner a similar tag with his name or initials and the letters N. W., and at the southwest corner a similar tag with his name or initials and the letters S. W., and at the southeast corner a similar tag with his name or initials and the letters S. E., which tags shall be so secured that they shall be above high-water mark; and said grantee and his legal representatives shall continue said stakes, bushes, buoys, ranges and marks.

If any area conveyed to a resident of Maryland for the cultivation of oysters, as herein provided, shall remain without the landmarks and other marks prescribed in sec. ..., for one year after notice of the absence of said marks has been given by the State to the owner of said franchise or his legal representative, as the same shall appear on the books of the State Oyster Commission, said area shall

revert to the State of Maryland, and said lease shall become of no value; and nothing in this act shall be construed to give to the holders of land for the cultivation of oysters, the right to cultivate or take oysters upon said land unless the landmarks and other marks prescribed by this act are in place at the time said oysters are planted or taken.

Any franchise for the cultivation of oysters granted according to the provisions of this act may be assigned to any resident of the State of Maryland by a written assignment in manner and form following:

Assignment of Oyster Franchise.

Know all men by these presents, that ....., of the ..... and State of Maryland, in consideration of the sum of ..... dollars received to ..... full satisfaction has sold, assigned and conveyed, and by these presents does sell, assign and convey to ....., of the ..... and the State of Maryland, all such right, title and interest as ..... has or ought to have in and to the perpetual franchise for cultivating oysters in the following described grounds, to wit: ....., being the same franchise heretofore granted to ....., of the ..... and the State of Maryland, by the Oyster Commissioners of Maryland, by grant, dated the ..... day of ....., A. D. 188 , and recorded in the office of the Oyster Commissioners at ..... in the office of the State Oyster Commission, at ....., in book ....., page ..., to have and to hold the same unto the said assignee and his legal representatives forever, subject, nevertheless, to all the conditions, reservations, stipulations and provisions in the said grant contained.

In witness whereof, ... have hereto set our hand and seal this ..... day of ..... A. D. 188 .

Signed, sealed and delivered in presence of

.... [L. S.]

.... [L. S.]

.... [L. S.]

....., Md., ..., A. D. 188 .

Personally appeared ....., signer and sealer of the foregoing instrument, and acknowledged the same to be ..... free act and deed, before me.

.....

Received for record ....., 188 , at ... o'clock ... M.

And be it enacted, That all applications, designations, assignments, and all papers and maps pertaining to any allotment, designation or assignment of oyster grounds within the deep-water oyster fishery shall be recorded in the office of the Oyster Commission.

And be it enacted, That the same fees shall be paid for recording or copying papers and maps in the office of the Oyster Commission as are charged by the County Clerks for like services; and all fees so paid shall be accounted for and paid to the Treasurer of the State for the benefit of the State.

And be it enacted, That leasehold interests in oyster beds, granted according to the provisions of this act, may be attached in the same manner as real estate, and executions may be levied on them in the same manner as upon real estate.

Whenever the right to cultivate oysters in any part of "District No. 6" shall be sold according to the provisions of this act, the Oyster Commissioners shall at once give written notice to the Clerks of the Circuit Court in the counties bordering upon said district that said right has been sold, and that no application shall thereafter be received by said clerks for permits to cultivate oysters upon any part of said area under the provisions of this act.

The districts of the Deep-Water Oyster Fishery, herein named, to wit, "District No. 1," "District No. 3," "District No. 5," "District No. 7," "District No. 9," and "District No. 11," shall be known as the "open waters of the Deep-Water Oyster Fishery," and shall be open to all persons, who

have been residents of the State of Maryland for the year next preceding, for the catching of oysters under the provisions and restrictions hereinafter named.

No person shall take or catch oysters within the open waters of the Deep-Water Oyster Fishery between the 1st day of April, 1884, and the 15th day October, 1884, or between the 1st day of April, 1885, and the 15th day of October, 1885, or during the time which shall be established as a closed season by the General Assembly at its session in 1886, or on Sunday, or in the night time, provided that nothing in this act shall be construed to prohibit any holder of ground appropriated for the cultivation of oysters under the provisions of this act, from taking oysters in the day time at any time except on Sunday.

The Oyster Commissioners shall make annual examination of all the oyster beds known to them in the open waters of the deep-water oyster fishery, and they shall report to the General Assembly the results of this examination, and whenever any of the districts which are closed by the provisions of this act shall, in their judgment, be in proper condition to be opened, they shall select districts of equivalent or nearly equivalent area within the open waters, and shall recommend that they be closed in place of those which are opened.

Whenever, in the judgment of the Oyster Commissioners, any oyster bed within the open waters is in imminent danger of exhaustion they may close such bed for such time as they may deem necessary, and the Commander of the Fishery Force shall at once cause four spar buoys to be placed at the four corners of the said oyster bed, said buoys to be two feet long and ten inches in diameter, painted in alternate red, black and white bands, four inches wide, and the buoy which is placed at the northeast corner shall have the letters N. E. painted in black, four inches high, on one of the white stripes, and the buoy which is placed at the northwest corner shall have the letters N. W. painted in the same way, and that at the southwest corner the letters S. W., and that at the southeast corner the letters S. E.; provided that no part of the open waters shall be closed within one year from the passage of this act, and provided that not more than one-half of any district shall be closed at any one time, and provided that no bed shall be closed for more than one year, except by an act of the General Assembly.

No boat propelled in part or entirely by steam shall be used in catching oysters within the deep-water oyster fishery, and no other boat shall be used in catching oysters with scoop, scrape, dredge or similar instrument, unless said boat shall have on board at the time said boat is so used in taking oysters a license which shall have been issued to said boat according to the provisions of this act; provided that nothing in this act shall be construed to prevent any holder of grounds appropriated for the cultivation of oysters, under the provisions of this act, from taking oysters upon said grounds in such manner as he shall choose.

Any resident of the State of Maryland may make application, in writing, to the Comptroller of the Treasury for a license to use any boat or vessel in dredging for oysters within the open waters of the Deep Water Oyster Fishery, which application shall have attached to it a certificate from a clerk of the Circuit Court, or the clerk of the Court of Common Pleas of Baltimore City, or the Comptroller or his clerk, that said applicant has personally appeared before him and made oath that all the statements contained in said application are true, and said application shall be accompanied by a written certificate that the master of said boat has made oath, in the same manner, that he has been a resident of the State of Maryland for one year next preceding the date of said application; and if the boat for which a license is asked shall have been measured by the oyster commissioners, said application shall be accompanied by their certificate of the enrollment and tonnage of said boat, shall state the name and class said of boat, and shall be in manner and form following, to wit:

I,....., a resident of the county of....., in the State of Maryland, do respectfully show that I have been a resident of the State of Maryland for one year next preceding the date of this

application; that I am the owner of the.....of.....; that there is no lien on said boat held by a non-resident of Maryland; that the said boat is of.....tonnage; that the said boat is not held with an intention to violate the law. I therefore respectfully request that you will issue to me a license to use said.....in dredging for oysters within the open waters of the Deep Water Oyster Fishery, according to the provisions of an act entitled "An Act to Protect and Improve the Oyster Fisheries of the Chesapeake Bay and its Tributaries," passed by the General Assembly of Maryland on the.....

....., A. D., 188... Signed.....

And be it enacted, That no license to dredge for oysters shall be issued to any boat, until said boat shall have received a certificate of tonnage, from the board of State Oyster Commissioners, and that the State Oyster Commissioners shall, upon application, and upon receipt of a fee of $10, measure the tonnage of any boat, according to the rules for the measurement of tonnage....., and shall issue to the applicant a certificate of the tonnage of said boat.

Upon receipt of an application in writing in the manner and form provided in section...of this act, together with the accompaning documents, and upon the receipt of three dollars per ton for every ton said boat may measure, the Comptroller of the Treasury shall issue to said applicant a license to use said boat in dredging for oysters within the open waters of the Deep Water Oyster Fishery, for one year from the day when said license is issued, which license shall be in manner and form following, to wit:

Whereas....., of the county of....., in the State of Maryland, has made application to me for a license to use the.....of.....in taking oysters with dredges within the open waters of the Deep Water Oyster Fishery, and whereas said.....has complied with all the requirements of an act entitled "An Act to Protect and Improve the Oyster Fisheries of the Chesapeake Bay and its Tributaries," passed by the General Assembly on the...day of...188...; and whereas said.....has paid to me the sum of..... for the benefit of the State of Maryland; now, therefore,

Know all men by these presents, that the State of Maryland, in consideration of the premises, and especially for the sum of.....duly received from said.....does give unto the said.....the right to use said.....in taking oysters with dredges or similar instruments for one year from this date, within the districts described and designated as the open waters of the Deep Water Oyster Fishery in section...of the act hereinbefore mentioned; provided that said boat shall not be used for taking oysters on Sunday or in the night time, or between the first day of April and the fifteenth day of October, or in any waters except the waters hereinbefore designated, or on any beds reserved and buoyed by the State Fishery Force, in accordance with the provisions of section...of the act hereinbefore mentioned, or on any grounds appropriated, according to the provisions of said act, for the cultivation of oysters; and provided further that this license shall be on board said boat whenever she is used for taking oysters, and shall be exhibited whenever called for by any officer of the State of Maryland; and provided said boat shall be designated by the number.....and shall exhibit the numbers which are specified and described in section of the act hereinbefore mentioned.

....., Md.,....., A. D., 188.

Signed .....

Comptroller of the Treasury.

And be it enacted, That all licenses which shall be issued after the first day of April, 1885, shall contain in place of the words "between the first day of April and the fifteenth day of October" the words "during the closed season which shall be established by the General Assembly at the session of 1886," or else the dates which shall be so established.

And be it enacted, That it shall be lawful for the owner of any boat licensed to dredge for oysters according to the provisions of this act, whenever said owner shall sell and convey by bill of sale, for

a bona fine consideration, said boat unto any person who has been a resident of the State of Maryland for at least one year, to transfer the said license to said vendee with said boat, which license, when transferred, shall entitle said vendee to the same right to use said boat in catching oysters that the vendor or assignor had before said assignment; provided the said vendor or assignor shall appear before the Comptroller of the Treasury and make oath before him to all the facts, matters, things and perquisites required, according to the provisions of this act, from an applicant for a license to use a boat in dredging for oysters, and the Comptroller of the Treasury shall certify to said oath in writing upon said license, for which said assignee or vendee shall pay the sum of five dollars for the benefit of the State of Maryland.

And be it enacted, That the Comptroller of the Treasury shall have painted in black figures, on white canvas, two sets of numbers, corresponding to the license to catch oysters with scoop, scrape, dredge, or any similar instrument; each figure shall be twenty-two inches in length, and of proportionate width, and the figures at least six inches apart; and he shall give to each person taking out such license two numbers thereof, one of which shall be firmly sewed upon the starboard side and in the middle of that part of the mainsail which is above the close reef, and the other number on the port side and in the middle part of the jib which is above the bonnet and reef. These numbers shall be placed in an upright position and worn at all times during the dredging season, and shall not be concealed or defaced; and no other number shall be exposed to view or used than that which is furnished by the Comptroller, who shall register the number of each boat licensed as above, and shall record upon the license the number of the boat, and shall, upon the receipt of the sum of fifty cents for each number, issue duplicate numbers; and any person who shall use, in dredging for oysters, any licensed boat which is not numbered according to the provisions of this section, shall be liable to the penalties prescribed in this act for dredging without a license.

The Comptroller of the Treasury shall give into the hands of each person who shall receive from him a license to use any boat in dredging for oysters, and into the hands of each assignee or vendee of any such boat, a copy of this act, together with a map or maps of the Deep-Water Oyster Fishery, upon which map or maps the districts where dredging is allowed by law shall be clearly delineated; and the Comptroller of the Treasury shall cause a similar copy of the hereinbefore named laws and maps to be delivered or sent by mail to any citizen of Maryland upon receipt of a request for such laws and maps and the sum of fifty cents.

And be it enacted, That the officer in command of each boat of the State Fishery Force shall keep a daily record of the numbers of all vessels engaged in dredging in his district, and shall forward this record on the first day of each month to the Board of State Oyster Commissioners, who shall enter it in a book kept for this purpose, and whenever this record shall indicate that two or more boats are dredging under the same number, the Commander of the Fishery Force shall issue orders to all officers to overhaul and examine all boats which exhibit said number, and to arrest all persons and to seize all boats which are not licensed as herein provided.

And be it enacted, That any resident of this State desiring to use any boat in taking oysters from public beds with rakes or tongs, for sale, shall first obtain from the clerk of the Circuit Court of the county wherein he may reside a license therefor; and such license shall have effect from the first day of June, in the year in which it may have been obtained, to the first day of June next succeeding; provided that such license shall not authorize the use of said boat or canoe in taking oysters within the limits of districts Nos. 2, 4, 6, 8 and 10, or on any bed which may be reserved and buoyed by the officers of the State Fishery Force, according to the provisions of this act; or the taking of oysters in the night time or on Sunday, or between the first day of April and the fifteenth day of October.

And be it enacted, That each license to take oysters, for sale, with rakes or tongs, shall state the name and residence of the person to whom the same is granted, the number of said boat, the period

at which said license will expire, and the length of the boat or canoe, measured along the top over all; and every applicant for such license shall pay to the clerk of the court where such license may be granted, and before the issuing and delivery of the same, according to the following rates, viz: For any boat measuring in length twenty feet or less, the sum of two dollars; measuring from twenty to twenty-five feet, the sum of three dollars; measuring from twenty-five to thirty feet, the sum of four dollars; and for any boat over thirty feet long, including sloops under custom-house tonnage, the sum of five dollars; and no license to take oysters with rakes or tongs shall be issued to any boat or vessel which is licensed to take oysters with scoop, scrape, drag, dredge, or any similar instrument; and the Comptroller of the Treasury shall cause to be printed and delivered to the clerks of the Circuit Courts of the several counties the requisite number of blank licenses, and he shall take receipts for the same, as for other licenses furnished; and the said clerks shall, on the first Monday in March and December in each year, return to the Comptroller of the Treasury a list of all licenses issued, and shall pay to him, to the credit of the oyster fund, all moneys received for licenses.

And be it enacted, That every applicant for a license to use any canoe or boat in taking oysters with rakes or tongs shall be required to make oath or affirmation before the clerk authorized to issue the same, or before some justice of the peace, on whose certificate of the taking of such oath or affirmation the clerk shall issue said license, that the facts set forth in said license are true; that he has been a *bona fide* resident of the State for the twelve months next preceding his application; that he will not allow said canoe or boat to be used in taking oysters by non-residents of the State; that he will comply with all the laws of the State regulating the taking of oysters; and every person to whom such license shall be granted shall paint the number of his canoe or boat on the outside thereof, near the gunwale, in black figures not less than three inches long and of proportionate width, on a white ground, and no number other than that in said license shall be exposed to view on said canoe or boat; and any person who shall use for taking oysters any licensed canoe or boat which is not numbered according to the provisions of this act shall be liable to the penalties prescribed by this act for taking oysters without a license.

And be it enacted, That the Clerk of the Circuit Court shall give into the hands of each person who shall receive from him a license to use any canoe or boat in taking oysters for sale with rakes or tongs, a copy of this act, together with a map or maps upon which the waters where the taking of oysters is prohibited shall be clearly delineated, and the Comptroller of the Treasury shall cause to be printed and delivered to the Clerk of the Circuit Court the requisite number of copies of this act and of the map or maps above named, and shall take receipt for the same.

And be it enacted, That all oysters which are taken from any of the public waters of this State shall be culled upon their natural beds as they are taken, and any person who shall remove or take away from any of the public waters of this State any oyster shells except those which are so firmly fastened to living oysters that they cannot be removed without injuring the oysters; and any person who shall take or sell any oysters for the purpose of converting their shells into lime, or for the purpose of using their shells in the manufacture of iron, or for the purpose of manuring land; and any person who shall use any oysters for manuring land, or in the manufacture of iron, or in the manufacture of lime; and any person who shall take oysters within this State on Sunday, and any person who shall take oysters in any of the public waters of this State between the first day of April and the fifteenth day of October; and any person who shall take oysters within the limits of Districts No. 2, No. 4, No. 6, No. 8 and No. 10, and any person who shall, without authority, take oysters from any grounds appropriated for the cultivation of oysters under the provisions of this act; and any person who shall wilfully injure any grounds thus appropriated for the cultivation of oysters, and lawfully designated, marked out and enclosed, or the oysters therein, by depositing mud or other substances thereon; and any person who shall wilfully injure, remove or displace any buoys, bushes, stakes or other marks which may be used to mark out any grounds appropriated for the cultivation of oysters:

and any person who shall injure the dam or gate of any oyster pond; and any person who shall remove from any ground appropriated for the cultivation of oysters any substance upon which young oysters will set; and any person who shall be found within the boundaries of any ground appropriated for the cultivation of oysters, having in his possession any instrument for taking oysters, and being in the customary attitude for using such instrument; and any person who shall use in taking oysters in this State any boat propelled wholly or in part by steam; and any person who shall take oysters with scrape, scoop, drag, dredge, or any similar instrument anywhere in this State except within the limits of District No. 1, No. 3, No. 5, No. 7, No. 9 and No. 11; and any person who shall take oysters in this State with scoop, scrape, drag, dredge or similar instrument without having in his possession at the time the license required by the provisions of this act, and without exhibiting the numbers required by the provisions of this act; and any person who shall use for taking oysters in this State for sale, with rake or tongs, any canoe or boat, without having in his possession at the time the license required by the provisions of this act, and without exhibiting the number required by this act; and any person who, being a non-resident of this State, shall take oysters in this State, shall be guilty of felony, and any person who shall be convicted of any of the offenses hereinbefore named, committed in the day time, shall be imprisoned in the penitentiary for not less than one nor more than three years for each offense; and any person who shall be convicted of any of the offenses hereinbefore named, committed in the night-time, and any person who shall take oysters in this State in the night time, shall be imprisoned in the penitentiary for not less than two nor more than five years, for each offense, and it shall be the duty of all sheriffs, deputy sheriffs, and constables, and of all officers of the State Fishery Force, to arrest all persons found violating any of the provisions of this act, and to bring them before a judge of the Circuit Court or a justice of the peace, to be dealt with as herein provided; and any boat or canoe or vessel of any kind used in the violation of any of the provisions of this act shall be forfeited to the State of Maryland, together with all her outfit, apparel and furniture, and all sheriffs, deputy sheriffs, and constables, and all officers of the State Fishery Force shall and any other person may seize any canoe, boat or vessel of any kind which shall have been used in violation of the provisions of this act, together with all her outfit, apparel and furniture, wherever found, within one year thereafter, and hold said property to be dealt with according to the provisions of this act; provided that nothing in this act shall be construed to forbid the holder of any grounds appropriated under the provisions of this act, for the cultivation of oysters, from taking said oysters, or from working upon said grounds, in any manner and at any time that said person may choose, except on Sunday or in the night; and provided that whenever any boat or vessel shall be used in the violation of any of the provisions of this act, the person in command and the owner or owners, if aboard, and the master named in the license of said boat, if aboard, shall be held responsible, and shall be proceeded against as hereinafter provided.

If any canoe, boat or vessel of any kind shall be seen in the attitude which is customary for taking oysters, in any of the waters where the taking of oysters is prohibited by the provisions of this act, the said canoe, boat or vessel shall be pursued by any officer authorized by this act to make arrests, and if said canoe, boat or vessel shall be found to have on board any wet oysters or shall be found to have on board any instruments for taking or catching oysters, it shall be prima facia evidence that said canoe, boat or vessel has been used in violation of this act, and it shall be the duty of the officer to arrest the person in command of said canoe, boat or vessel, and the owner and master, if aboard, and to bring the same before a judge having jurisdiction, and to seize said canoe, boat or vessel with all her outfit, apparel and furniture, and to bring them before a judge of the Circuit Court or a justice of the peace, to be dealt with as herein provided.

And be it enacted, That upon information given under oath to any judge of a Circuit Court having criminal jurisdiction, or to a justice of the peace, of any violation of the provisions of this act, he shall issue his warrant to the sheriff or any constable, or to any person whom he may authorize, requiring

him to proceed forthwith to arrest the party or parties alleged to have so offended, and to seize and to take into his possession any canoe, boat or vessel alleged to have been used in such offence, together with all her outfit, apparel and furniture, and to produce such alleged offender before said judge or justice, and to retain in his custody such canoe, boat or vessel, to be dealt with according to the provisions of this act, and to make such arrest and seizure the said officer may, if necessary, summon the *posse comitatus*.

And be it enacted, That the judge or justice of the peace, before whom any person may be brought, charged with a violation of the provisions of this act, shall swear the party so charged, to enter into recognizance with two sureties approved by said judge or justice of the peace, in a sum not less than five hundred dollars, for his or their appearance at the first term of the Circuit Court thereafter, and in default thereof, may commit said person or persons to jail; but the said person or persons so charged may elect to be tried without delay before said judge or justice, in which case the said judge or justice shall proceed forthwith to hear and determine the said charge; and if in any trial the said charge shall be sustained, the said court, or judge, or justice of the peace, shall impose the penalties prescribed in this act; and whenever any person authorized by this act to seize any boat, or canoe, or vessel, alleged to have been used in violating the provisions of this act, shall seize any such canoe, boat or vessel, said person shall forthwith give notice to any judge or justice having jurisdiction, and said judge or justice shall order notice to be given to the person who was in possession of the property seized, or to the owner thereof, if known, that the charge of the commission of such offense will be tried at the next term of the Circuit Court of the county in which such offense is alleged to have been committed; or, if the said person in possession, or owner, shall elect to have an immediate trial before said judge or justice, then the said judge or justice shall proceed forthwith to hear and determine whether the said property was used contrary to the provisions of this act; and if in any trial the said property shall be found to have been so used, the court, or judge, or justice, so finding, shall give immediate notice to the Board of State Oyster Commissioners, who shall at once take possession of said property and convey it to .....; and on the first day of each February, May, August and November, the Board of State Oyster Commissioners shall publish in two daily papers printed in Baltimore and in two newspapers printed in other parts of the State, a list of all the forfeited property in their custody, and they shall, at the same time and places, give notice that said property will be sold on the first day of the next month, at their office, to the highest bidder for cash, and on the first day of March, June, September and December, they shall cause all forfeited property, which has thus been advertised, to be sold at public auction, from the steps of their office, to the highest bidder for cash.

And be it enacted, That no person who buys or sells oysters for food shall have in his possession any oysters so small that a bushel measure, as defined by law, shall contain more than three hundred of them, in their shells, and each oyster, the shell of which measures more than one-fourth of an inch in any direction, shall be legally an oyster, in the enforcement of this section. The penalty for the violation of the provisions of this section shall be a fine of $50 for each offense, and the officers of the police boat shall visit all oyster-packing houses at least twice in each year for the enforcement of this section, and they shall have power to seize and take away any oysters which are herein prescribed, and they may sell said oysters for seed to be planted, and the proceeds of such sale shall be paid to the Comptroller of the Treasury to the credit of the oyster fund.

And be it enacted, That no person shall use any oyster shell for conversion into lime, nor in the manufacture of iron, nor in making roads or wharfs, under a penalty of $1 per bushel for all the shells so used; and no person shall deposit any shells in the public waters of the State in the night time, or on Sunday, or from any vessel which is at anchor, or which is not under way at the time, or upon any bottom which has not been designated for the dumping of shells by the Oyster Commission, under

a penalty of $50 for each offense; and the Oyster Commissioners shall publish, at least twice in each year, in such newspapers as shall be designated for the purpose, notices of the spots where shells may be deposited,and at least one spot in each district shall be opened to the public for the depositing at all times, except at night or on Sunday.

No person shall use for measuring oysters in the shell any measure which shall not have been duly inspected and sealed by the proper officers, under a forfeit of fifty dollars for each and every offense. Said forfeit shall be recoverable before any justice of the peace, by action of debt, in the name of the State of Maryland, one-half to go to the informer and the other half to be paid to the Comptroller, to the credit to the oyster fund. Each bushel shall be equal to the contents of a measure of the following dimensions, that is to say, sixteen and one-half inches across from inside to inside at the bottom, eighteen inches across from inside to inside at the top, and twenty-one inches diagonal from the inside chime to the top, and the same shall be even or struck measure.

And be it enacted, That any person except an officer of the State Fishery Force, who shall arrest any person who shall be convicted of a violation of any of the provisions of this act, or shall seize any boat or vessel, or other property which shall be condemned under the provisions of this act, shall be entitled to receive one-half of the fine which may be imposed, and one-half of the proceeds of the sale of the property condemned, and all other moneys received for fines imposed under the provisions of this act, or for the sale of property condemned under the provisions of this act after the payment of costs, and all money received for licenses to take oysters in this State, and all money received for the sale of the right to cultivate oysters upon any grounds in this State, shall be paid to the Comptroller of the Treasury to the credit of the oyster fund; and any court or judge, or justice who shall try any case under the provisions of this act, shall account to the Comptroller of the Treasury for all money received as fines, and shall also cause a copy of the record of such trial to be transmitted forthwith to the Board of Oyster Commissioners, and the expense of preparing and transmitting such record shall be included in the costs of said trial; and the Board of State Oyster Commissioners shall preserve a record of all trials under the provisions of this act, and they shall prepare and submit to each General Assembly, an analysis or digest of this Record.

Any person who shall resist any officer or person authorized under this act to make arrests of persons or seizures of property shall be deemed guilty of a misdemeanor,and upon indictment and conviction therefor in any court having jurisdiction shall be imprisoned in the jail of the county where the case shall be tried, or in the penitentiary, for not more than two years, or fined not less than fifty dollars, or more than five hundred dollars, in the discretion of the court.

And be it enacted, That parties tried under this act and acquitted shall have the cost of such trial paid by the Comptroller of the State out of the oyster fund.

And be it enacted, That nothing contained in this act shall deprive any person having the right to cultivate oysters under it of the right to bring a civil action for injury done to his property or rights.

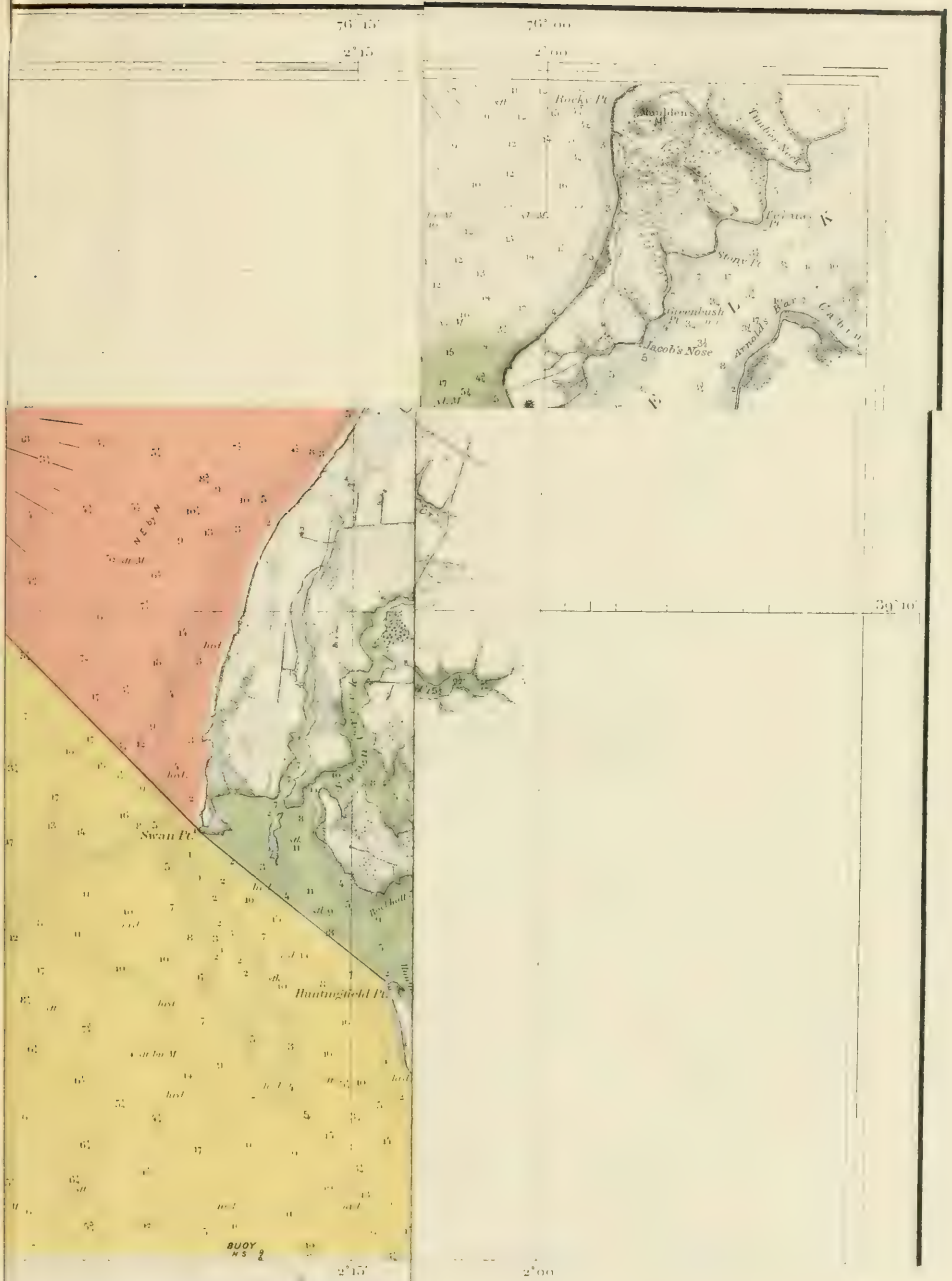
And be it enacted, That a Board of State Oyster Commissioners shall be established, to be composed of three commissioners, who shall perform all the duties required by the provisions of this act; and that the commander of the Fishery Force shall be one of the commissioners, the Comptroller of the Treasury another, while the third shall be a citizen of Maryland especially appointed by the Governor of the State, by and with the advice and consent of the General Assembly; and that said board shall be empowered to rent an office and to employ a clerk; and that they shall be required to be present at this office for the transaction of business from 10 A. M. to 3 P. M. on the second and fourth Saturday of each month.

And be it enacted, That nothing contained in this act shall be construed to affect any prosecution now pending for the violation of the existing law in this State.

And be it enacted, That all acts or parts of acts inconsistent with any of the provisions of this act are hereby repealed, and this act shall take effect from the day of its passage.

AN ACT to amend An Act entitled "An Act for the protection of the aids to navigation established by the authority of the United States Lighthouse Board within the State of Maryland," passed at the January session, eighteen hundred and eighty-two.

And be it enacted by the General Assembly of the State of Maryland, That an act, entitled "An act for the protection of the aids to navigation, established by the authority of the United States Lighthouse Board within the State of Maryland," passed at the January session, eighteen hundred and eighty-two, be amended by adding, after the words "Lighthouse Board," wherever they occur, the words "or by the authority of the Board of Oyster Commissioners of the State of Maryland."


76° 15'
76° 00
2° 15
2° 00
Rocky Pt
Aberdeen
Stone Pt
Jacob's Nose
Arnold's
Swan Pt
Huntingfield Pt
BUOY
39° 10'

B. Metcroft

COAST CHART No. 36

MAP OF OYSTER GROUNDS OF MARYLAND, No. 1.

CHESAPEAKE BAY

FROM HEAD OF BAY TO MAGOTHY RIVER

From a Trigonometrical Survey

under the direction of F R HASSLER and A D BACHE Superintendents of the

SURVEY OF THE COAST OF THE UNITED STATES

Topographs by F W WEBBER T S HASSLER R D CUTTS G D WISE Assts J C NELSON Sub Asst J B GLEECK R H WHITING Assts

Hydrographs by the parties under the command of

Lieuts Comdg G M BACHE S P LEE W P McARTHUR C H McBLAIR R RAYMOND USN Assts

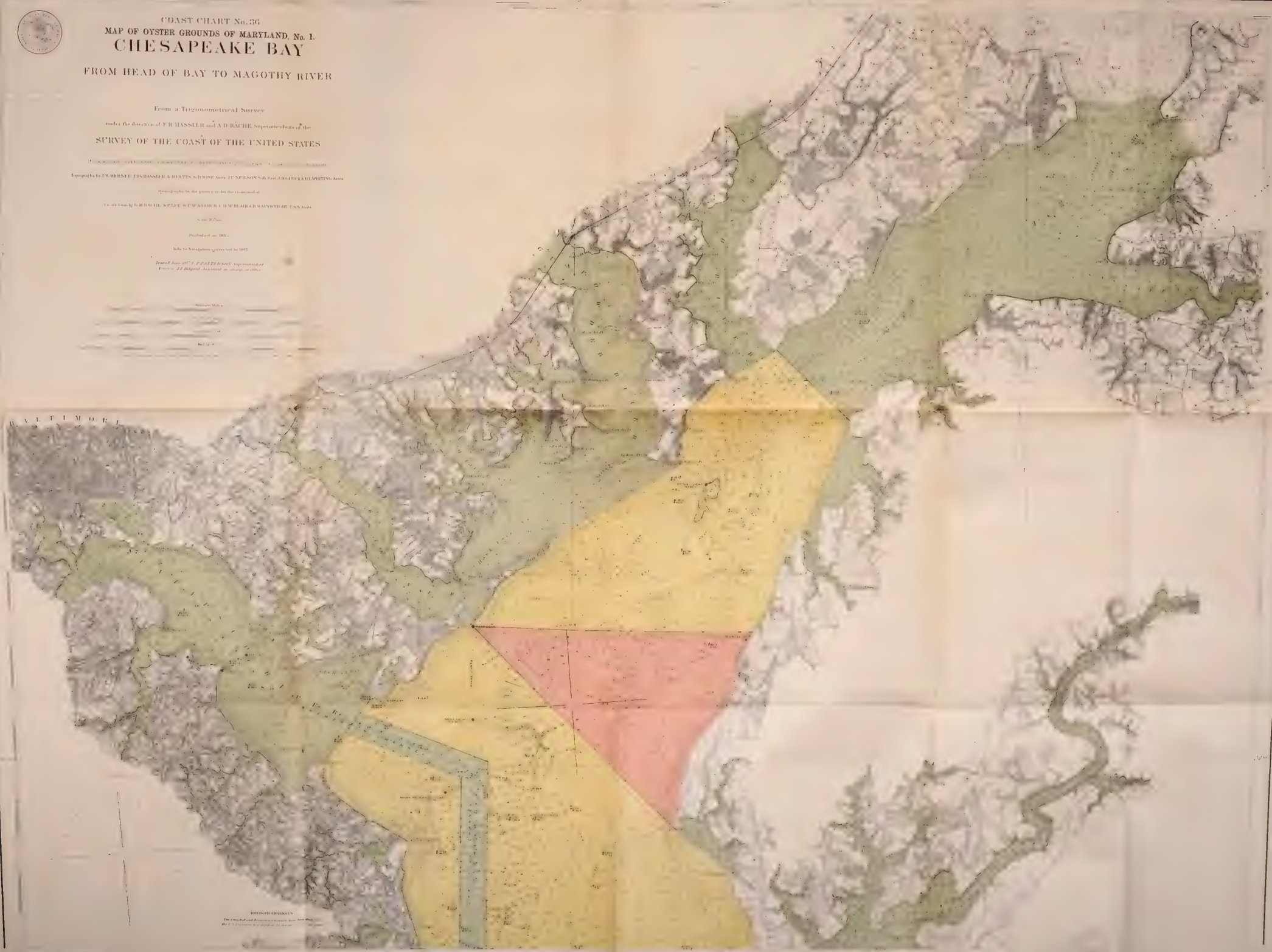
Scale 80000

Published at 1865.

Soils to Navigation Corrected to 1883

Issued June 1877 C P PATTERSON Superintendent
Chas A Schott Assistant in charge of office

Magnetic Meridian



DEEP WATER CHANNELS

The Limited and Prospective Channels have been Surveyed

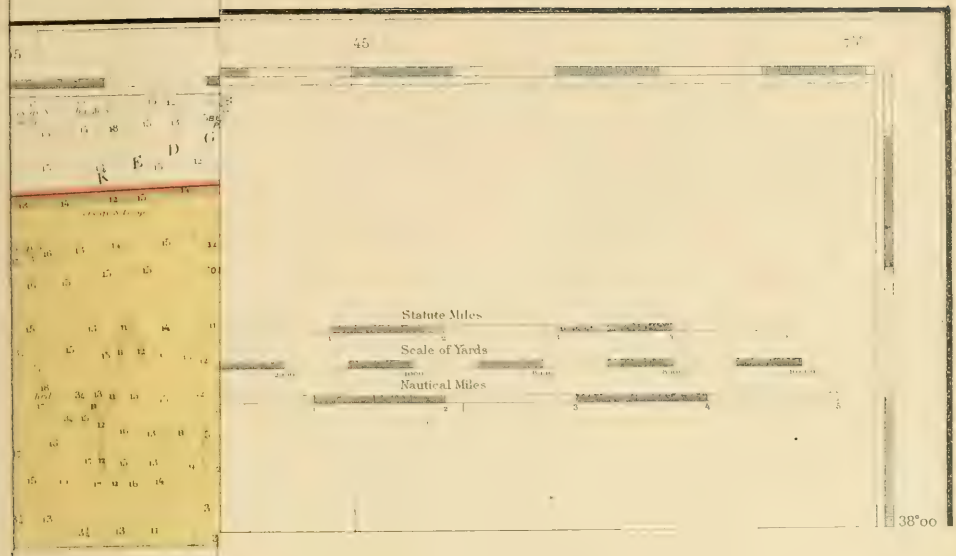
COAST CHARTS Nos. 34 35 36
MAP OF OYSTER GROUNDS OF MARYLAND, No. 2

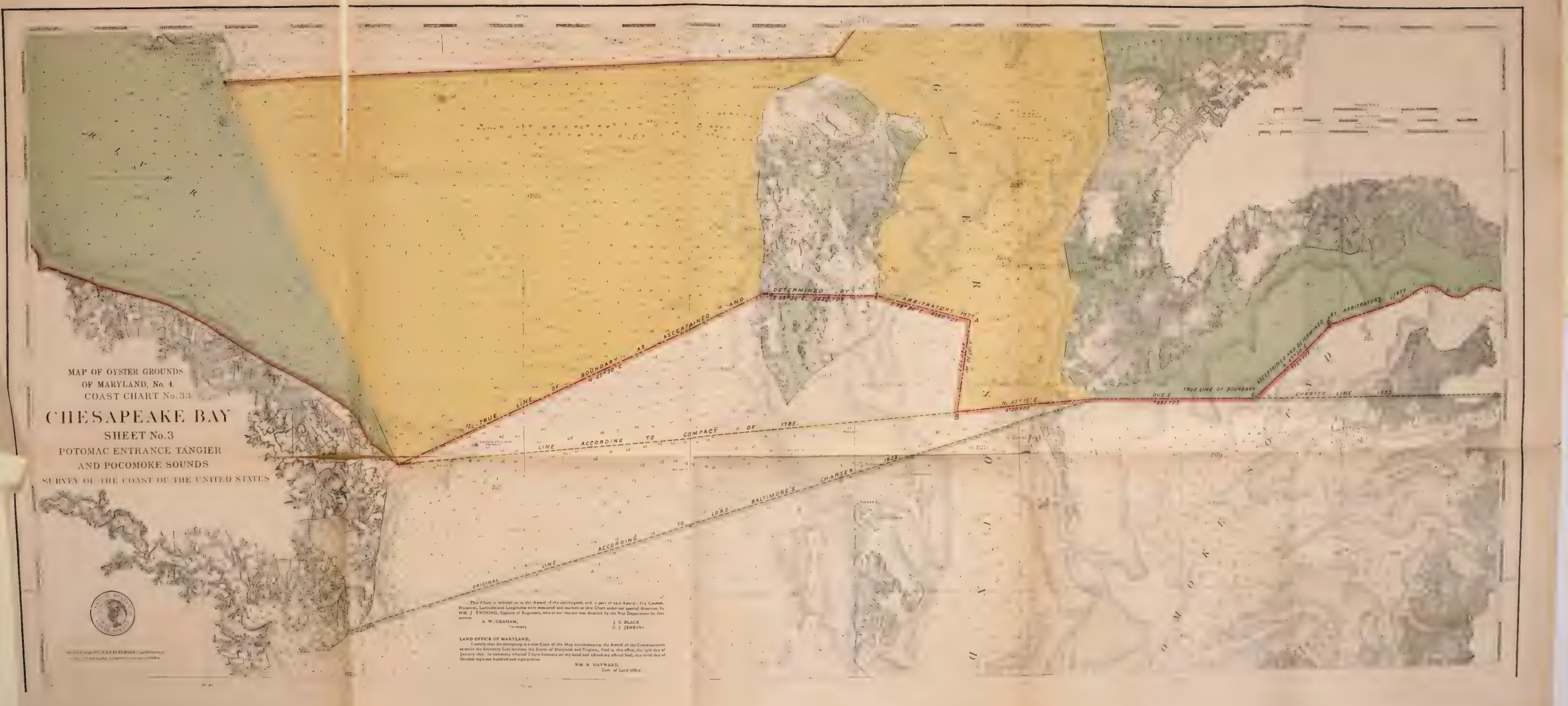
CHESAPEAKE BAY

FROM ITS HEAD TO POTOMAC RIVER

SURVEY OF THE COAST OF THE UNITED STATES

FROM MAGOTHY RIVER TO CHOPTANK RIVER


45
Statute Miles
Scale of Yards
Nautical Miles
38°00



This Chart is referred to in the Award of the undersigned, and a part of said Award— The Courses, Distances, Latitudes and Longitudes were measured and marked on this Chart under our special direction, by WM. J TWINING, Capitain of Engineers, who at our request was detailed by the War Department for that service

A. W. GRAHAM, Secretary
J. S. BLACK
C. J. JENKINS

LAND OFFICE OF MARYLAND,

I certify that the aforegoing is a true Copy of the Map accompanying the Award of the Commissioners to settle the Boundary Line between the States of Maryland and Virginia, filed in this office, the 15th day of January 1877. In testimony whereof I have hereunto set my hand and affixed my official Seal, this third day of October eighteen hundred and eighty-three

WM R HAYWARD,
Com. of Land Office

COAST CHART No. 34
MAP OF OYSTER GROUNDS OF MARYLAND, No. 3.
CHESAPEAKE BAY
FROM CHOPTANK RIVER TO POTOMAC RIVER
From a Trigonometrical Survey
under the direction of A.D.BACHE Superintendent of the
SURVEY OF THE COAST OF THE UNITED STATES
Published 1865
Statute Miles
Scale of Yards
Nautical Miles
Kilometres
BLOODSWORTH I.
TANGIER SOUND
POCOMOKE SOUND

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